Unrestricted Warfare Symposium 2007

Proceedings on Combating the Unrestricted Warfare Threat:

Integrating Strategy, Analysis, and Technology

20-21 March 2007

Sponsored By:

JOHNS HOPKINS
UNIVERSITY
APL SAIS

NATIONAL INTELLIGENCE COUNCIL
NIC

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA
OSD (PA&E)
OSD (POLICY)

DARPA

Ronald R. Luman, Executive Editor

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **MAR 2007**	2. REPORT TYPE	3. DATES COVERED **00-00-2007 to 00-00-2007**

4. TITLE AND SUBTITLE **Proceedings On Combating The Unrestricted Warfare Threat: Integrating Strategy, Analysis, And Technology**	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Johns Hopkins University Applied Physics Laboratory,Laurel,MD,20723**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR’S ACRONYM(S)
	11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**368**	

ACKNOWLEDGMENTS

Executive Editor:	Ronald Luman
Managing Editor:	Ellen Wilkinson
Project Editors:	Natalie Dickins
	Judith Marcus
	Daniel Portwood
	Weeta White
	Ellen Wilkinson
Art Directors:	Catherine Peacock
	Ian Courtney
Photo Credit:	Department of Defense Image Library

Special thanks to our sponsors at: the Office of the Undersecretary of Defense for Policy [OUSD(P)]; the Office of the Director, Program Analysis and Evaluation (ODPA&E); the Defense Advanced Research Projects Agency (DARPA); and the National Intelligence Council (NIC).

A complete list of symposium contributors can be found at the symposium's website: www.jhuapl.edu/urw_symposium/

Requests for permission to make copies of any part of the work should be mailed to:

Dr. Ronald R. Luman,
Director, National Security Analysis Deptartment
The Johns Hopkins University Applied Physics Laboratory
11100 Johns Hopkins Road
Laurel, Maryland 20723

Printed in the United States of America.

Contents

Foreword – Welcome and Perspective on Unrestricted Warfare
Ronald R. Luman 1

Chapter 1
Featured Papers

1.1 Warfighter Perspective on Integration of Strategy, Analysis, and Technology
James Cartwright 13

1.2 "Know Your Enemy"—The Importance of Sun Tsu's Admonition
Bruce Hoffman 37

1.3 The Achilles' Heel of Analysts
Michael Bauman 41

1.4 Technology Policy Message: Adapting to URW
Anthony Tether 57

1.5 Private Sector Viewpoint—Economic Infrastructure/ Systems Resiliency
Alfred Berkeley 77

1.6 Intelligence Community Perspective on the Maturing URW Threat
Mathew J. Burrows 97

Chapter 2
The Nature of URW

2.1 Moderator's Summary
Thomas Keaney 107

2.2 Scenarios for Future Conflicts
Michael O'Hanlon 111

2.3 Calibrating the WMD Threat
Brad Roberts 121

2.4 The Jihadist Threat
Mary Habeck 135

2.5 Questions and Answers Highlights
Transcripts 143

Chapter 3

Tailored Deterrence: What Will It Look Like?

3.1 Tailored Deterrence: What Will It Look Like?
Thomas M^{c}Namara, Jr. 161
3.2 Can Deterrence Be Tailored?
Charles Lutes 163
3.3 Tailored Dissuasion and Deterrence?
Jasen Castillo 173
3.4 Questions and Answers Highlights
Transcripts 183

Chapter 4

Analytic Successes and Applicability to URW

4.1 Moderator's Summary
L. Dean Simmons 191
4.2 Assessing Irregular Warfare
Timothy Bright 197
4.3 Complex Adaptive Systems, Multiagent-Based Models, and Some Heuristics Regarding Their Applicability to URW
Andy Ilachinski 205
4.4 Economic Analysis and Unrestricted Warfare
Gary M. Shiffman 223
4.5 Questions and Answers Highlights
Transcripts 237

Chapter 5

URW in the Information Domain

5.1 Moderator's Summary
Timothy Galpin 251
5.2 The Digital Dimension
James Gosler 255
5.3 Cyberspace ... the undeclared war!
Daniel Wolf 269
5.4 Lead-Turning the 21st Century Fight: CYBERSPACE
Steven McPherson 281
5.5 Questions and Answers Highlights
Transcripts 297

Chapter 6
URW in the Physical Domain
6.1 Moderator's Summary
José Latimer 305

Chapter 7
Senior Perspectives
7.1 Eric Olson 313
7.2 Albert Calland 319
7.3 Nancy Brown 323
7.4 Thomas Mahnken 325
7.5 Philip Mudd 329
7.6 Questions and Answers Highlights
Transcripts 335

Afterthoughts
John M^{c}Laughlin 347

Appendix A
Symposium Agenda 349

Appendix B
Acronyms and Abbreviations 353

FOREWORD

WELCOME AND PERSPECTIVE ON UNRESTRICTED WARFARE

FOREWORD – WELCOME AND PERSPECTIVE ON UNRESTRICTED WARFARE

Ronald R. Luman

INTRODUCTION

On behalf of The Johns Hopkins University's Applied Physics Laboratory and its Paul H. Nitze School of Advanced International Studies, I welcome you to this 2007 symposium on Combating the Unrestricted Warfare (URW) Threat: Integrating Strategy, Analysis, and Technology.

This year, the symposium is co-sponsored by government leaders in the strategy, analysis, technology, and intelligence communities: the Office of the Undersecretary of Defense for Policy [OUSD(P)]; Office of the Director, Program Analysis and Evaluation (ODPA&E); the Defense Advanced Research Projects Agency (DARPA); and the National Intelligence Council (NIC). We have a unique opportunity to join an emerging community of experts that seeks to meet the unrestricted warfare threat by integrating strategy, analysis, and technology.

In addition to our scheduled keynote, luncheon, and dinner featured speakers, we have organized roundtables to address particular challenge areas and seek to integrate diverse perspectives to further develop an understanding of unrestricted warfare threats and strategies, explore approaches to analysis and assessment, and examine technological counters to threats

Dr. Ronald R. Luman is Head of the National Security Analysis Department at The Johns Hopkins University Applied Physics Laboratory. Dr. Luman has a broad base of technical experience in areas such as ballistic missile accuracy, unmanned undersea vehicles, countermine warfare, national missile defense, and intelligence, with particular emphasis on system of systems engineering.

in both the information and physical domains. Accordingly, we have five roundtables this year:

- Strategic Policy: The Nature of URW
- Analytic Successes and Applicability to URW
- URW in the Information Domain
- URW in the Physical Domain
- Strategic Policy: Tailored Deterrence

During the next 2 days, I encourage you to network and actively participate during breaks, to formulate new ideas, and to forge collaborative relationships with other participants. Seize opportunities to participate, inquire, and respond to the diverse topics presented using response cards, interactive tablet PCs, or handheld devices. Our common objective is to meet the URW challenge through an integrated approach.

We have produced summary papers from transcripts and presentations submitted by experts leading in the URW challenge. Content submitted in presentation graphics has not been altered in any way.

What is Unrestricted Warfare?

In 2006, the URW Symposium focused on exploring the diverse nature of unconventional warfare. This new threat, which has come to be known as "unrestricted warfare" (URW). Unfortunately, URW is another NOT word that we tend to use when we do not fully understand something. It joins unconventional, irregular, and asymmetric as terms in our conflict vocabulary; but it is broader than all of those. URW spans two of the four "security environments" the Department of Defense (DoD) identified for use in strategic planning, Irregular and Catastrophic, and may extend to the Disruptive (Figure 1).

Unrestricted warfare involves both state and nonstate actors seeking to gain advantage over stronger state opponents. These actors will employ a multitude of means, both military and nonmilitary, to strike out during times of real or perceived conflict.

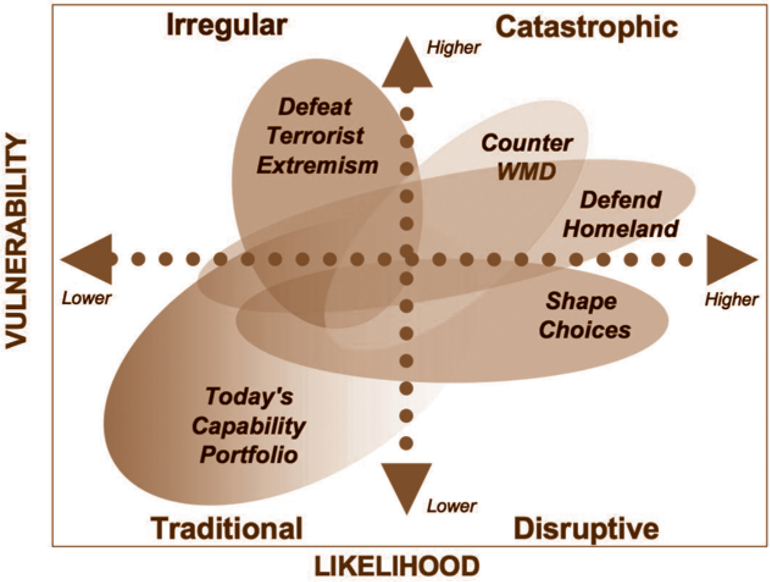


Figure 1 The DoD Security Environment Quadrant

The first rule of unrestricted warfare is that there are no rules; nothing is forbidden. Unrestricted warfare employs *surprise and deception* and uses both civilian technology and military weapons to break the opponent's will. The recent book by Qiao Liang and Wang Xiangsui offers an overview of unrestricted warfare, utilizing "*unrestricted employment of measures, but restricted to the accomplishment of limited objectives*." Among the many means cited in their description of unrestricted warfare are *integrated attacks* exploiting diverse areas of vulnerability to produce a grand strategy:

- Cultural warfare by influencing or controlling cultural viewpoints within the adversary nation
- Drug warfare by targeting an adversary nation with illegal drugs
- Economic aid warfare by using aid dependency to control a targeted adversary
- Environmental warfare by despoiling the natural environment of the adversary nation

- Financial warfare by subverting the adversary's banking system and stock market
- International law warfare by subverting the policies of international or multinational organizations
- Media warfare by manipulating foreign news media
- Network warfare by dominating or subverting transnational information systems
- Psychological warfare by dominating the adversary nation's perception of its capabilities
- Resource warfare by controlling access to scarce natural resources or manipulating their market value
- Smuggling warfare by flooding an adversary's markets with illegal goods
- Technological warfare by gaining advantage or control of key civilian and military technologies
- Terrorism

URW Characteristics

Unrestricted warfare demands "unrestricted employment of measures but restricted to the accomplishment of limited objectives." It employs the elements of surprise and deception in asymmetric attacks. These attacks can be integrated to exploit diverse areas of vulnerability of a conventionally stronger opponent. Specifically, battlefields expand beyond the conventional physical domain to break the opponents' will in areas that are visible and have a tangible and threatening effect on the target nation's political base. For more than a decade, we have witnessed a surge of terrorist acts. Bruce Hoffman, in his book *Understanding Terrorism*, characterizes these acts as five processes designed to achieve key objectives:

1. *Attention.* Terrorists seek media attention to themselves and their cause through dramatic, violent acts.

2. *Acknowledgment*. Terrorists seek to translate their newfound notoriety in the states or international community into acknowledgment, sympathy, and support for their cause.

3. *Recognition*. Terrorists attempt to capitalize on the interest and acknowledgment that their violent acts have generated by obtaining recognition of their rights or acceptance of the justification for their cause and or their organization.

4. *Authority*. Terrorists seek the authority to effect the changes in government and society reflected in their movement's struggle. This may involve a change in government or in the state structure, redistribution of wealth, adjustment of geographical boundaries, assertion of minority rights, imposition of theocratic rule, or other transformation.

5. *Governance*. Terrorists seek to consolidate their direct and complete control over the state, its homeland, and its people.

Adversarial Characteristics of URW

Unconventional warfare employs small, well-organized units. These organizations are cell-structured, not organized as a hierarchical military force.

They are integrated within society, not apart from it; and they operate globally, using technology that broadens their reach beyond regions. State and nonstate actors may form ad hoc and unexpected alliances of convenience.

URW Effects

Here, the few can impact the many with a global reach enabled by advanced information technology. The effect is that tactical level engagements can immediately affect strategic security postures. Insurgents and terrorist groups spread like viral organisms, adapting and shifting command and control strategy and tactics. Their ability to adapt, change strategy, and persist serves to empower and shape generations of disenfranchised or radicalized activists, both here and abroad. This symposium provides disturbing insights into the dramatic shifts in traditional Islamist doctrine, the adoption of irregular warfare strategies by both state and nonstate adversaries, and the global spread of new warfare technologies that have the potential to increase the effectiveness of adversaries' attacks.

The National Critical Challenge

The United States must adapt its national security focus to fighting and defending itself against the radical Islamic insurgency and future adversaries who choose catastrophic terrorist attacks as their weapon of choice. This involves development of strategy, concepts, and capabilities appropriate to protracted conflicts of an unrestricted nature.

Unrestricted warfare will manifest itself across the full spectrum of political, social, economic, and military networks, blurring the distinction between war and peace and between combatants and bystanders. This type of war is not new, as noted by President John F. Kennedy in 1962. What is new and different today is the global reach of adversaries, enabled by advanced information technology.

> *"This is another type of war, new in its intensity, ancient in its origins—war by guerrillas, subversives, insurgents, assassins; war by ambush instead of by combat; by infiltration instead of aggression, seeking victory by eroding and exhausting the enemy instead of engaging him . . . It requires in those situations where we must counter it . . . a whole new kind of strategy, a wholly different kind of force, and therefore a new and wholly different kind of military training."*
>
> *President John F. Kennedy*
>
> *USMA Graduation Speech, 1962*

Strategy, Analysis, and Technology Integration

We borrow Qiao and Wang's description of URW to acknowledge their perspective, but we seek our own assessment of what leading strategists, analysts, and technologists should consider viable future force capabilities and strategies.

We encourage your active participation, networking, and knowledge sharing to form a new, integrated community dedicated to countering our increasingly sophisticated adversaries. At this symposium, you have self-identified as being 40% strategists, 40% analysts, and about 20% technologists.

We are forming a multidisciplinary community with balanced perspectives and talents. Political scientists, historians, and international relations people tend to gravitate toward strategy. Naturally, scientists and engineers tend to gravitate toward technology; and analysts can come from a variety of backgrounds but are principally technically trained.

Figure 2 illustrates the integration of these distinct communities and what we need to draw from one another to form effective solutions to combating unconventional adversaries. It is imperative to tailor deterrence postures and courses of action (COA), Science and Technology (S&T), and Research Development Technology and Engineering (RDT&E).

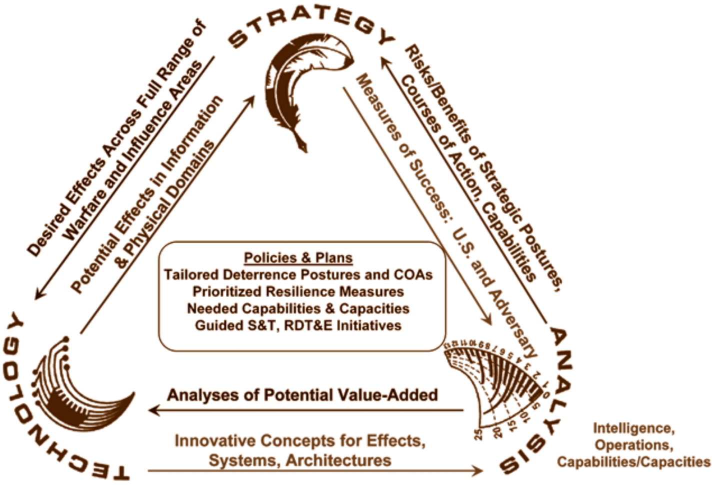

STRATEGY
Desired Effects Across Full Range of Warfare and Influence Areas
Potential Effects in Information & Physical Domains
Risks/Benefits of Strategic Postures, Courses of Action, Capabilities
Measures of Success: U.S. and Adversary
Policies & Plans
Tailored Deterrence Postures and COAs
Prioritized Resilience Measures
Needed Capabilities & Capacities
Guided S&T, RDT&E Initiatives
TECHNOLOGY
ANALYSIS
Analyses of Potential Value-Added
Innovative Concepts for Effects, Systems, Architectures
Intelligence, Operations, Capabilities/Capacities

Figure 2 Integrated Strategy, Technology, and Analysis

What Strategists, Analysts, and Technologist Need From One Another

Specifically, the *strategy community* needs to understand the risks and benefits of various options for strategic postures, courses of action, and calls for additional capabilities. It needs insights from qualitative and quantitative analyses to guide the development of the full range of national security postures, which include tailored deterrence and adaptation of our offensive and defensive capabilities. The strategists should also understand what is technologically feasible with regard to potential effects in both the information and physical domains, and what strategy can be adapted from those domains.

The *analysis community* is unique in that it spans several domains, including intelligence, operations, and planning of new capabilities and capacities. Hence, the analysts cannot effectively work in a strategic or technological vacuum. Analysts need insights into U.S. and adversarial measures of overall success, not detailed measures of performance or evaluation but overall what each side values and what defines success. And, analysts need ideas and innovative concepts for effects, systems, and architectures to close areas of vulnerability.

The *technology community* needs to understand what effects are desired, operationally feasible, and potential innovative means to achieve those effects. For example, General James E. Cartwright is challenging the technology community with his Global Strike concept to reach out and touch any point on the earth in a short period of time. The analytic community can provide insights regarding the value-added of candidate technology. Especially useful are quantitative measures comparing new concepts to existing methods.

Together, we develop integrated policies and plans to enhance our effectiveness against adversaries employing URW. As illustrated in the center of Figure 2, we should:

1. address tailored deterrence postures and have the means to assess specific candidate courses of action;

2. develop prioritized resilience measures for homeland defense to enhance our own deterrence posture against URW threats;

3. develop integrated technical plans for needed capabilities and capacities across both the joint and interagency environments; and

4. provide focused guidance to our increasingly precious S&T and RDT&E initiatives to enhance the potential for transitioning technology to operational capability.

Our adversaries are increasingly sophisticated in integrating their efforts across the full spectrum of activity that constitutes unrestricted warfare. We will have to do the same to combat the threat.

Together, we need to understand what are the tailored deterrence postures that are founded in solid technology and understand the trade-offs.

REFERENCES

1. *Unrestricted Warfare*, Col. Qiao Liang and Col. Wang Xiangsui, Panama City, Panama: Pan American Publishing Co., 2002.

2. *Understanding Terrorism*, Bruce Hoffman, New York: Columbia University Press, 1998.

Chapter 1

Featured Papers

1.1 WARFIGHTER PERSPECTIVE ON INTEGRATION OF STRATEGY, ANALYSIS, AND TECHNOLOGY

James Cartwright

GENERAL CARTWRIGHT'S ADDRESS

We were getting up this morning in Nebraska to come to this symposium, and it was, as you can imagine, dark and cold with the north wind blowing on us—and we were making all the normal quips about the weather—such as, the only thing between us and Canada to slow the cold wind is barbed wire, and we had spent the last three months shoveling global warming... So it is a welcome change of climate to be here; it is good to have this opportunity. I applaud this conference and the agenda and the forum. And the warmer weather here.

My intent is to irritate you for at least 30 minutes. Then you can reverse the roles, and we will take the Q and A in any direction you want to go.

I think when you look at unrestricted warfare—when you look at warfare in the world that we live in today—a few things—at least from the military side of the equation and really for everybody—

General James E. Cartwright became Commander, United States Strategic Command (USSTRATCOM) in July 2004, responsible for the global command and control of U.S. strategic forces, providing strategic capabilities and options for the President and Secretary of Defense. Previously, he supported the Chairman of the Joint Chiefs of Staff in force structure requirements; studies, analyses, and assessments; and the evaluation of military forces, plans, programs, and strategies. He has served for more than 40 years with distinction in military operations and as a Naval Aviator. General Cartwright is a distinguished scholar, completing a fellowship with the Massachusetts Institute of Technology and an M.A. in National Security and Strategic Studies from the Naval War College.

should emerge. All of us here can justifiably assert that things really have changed in the world, but the pace of change in activity and the scale of that activity are truly phenomenal. When you think about the fall of the Berlin wall in 1989 and Operation Desert Storm in Iraq in 1991, and Afghanistan in October 2001, then back to Iraq in 2003—when you think about tsunamis and hurricanes and typhoons and volcanoes and earthquakes and two pandemics—and all of that occurring well within the short span of less than a single adult life, that should give you pause—because when you look back in history, that kind of activity is really unprecedented.

In the same context, consider the shift from the construct of the United States and Soviet Union as two monolithic powers engaged in a bipolar conflict, to a strategy requiring that the United States have the ability to conduct two regional wars or two major theater conflicts, focusing on four critical regions, as I believe Defense Planning Guidance (DPG) describes it: Northeast Asia, East Asian Littoral, Middle East/Southeast Asia, and Europe. That transition has happened in a very short period. Add to that the realization that the U.S. needs to think about its home territory, too.

Now we have to consider homeland protection, four critical regions, and two simultaneous wars—so the scope and the scale and the pace of the challenge have matured to the point where we have to find a way to put this in some sort of context. We have to look at how we are going to integrate this strategy, the way we analyze it, and the technology we need to manage it.

Much of the discussion about finding a perspective for the incredible pace of change and how to respond to it hinges on whether you approach it with concepts such as Thomas Friedman's flattening earth,[1] in which the playing field is being leveled, or you talk in terms of the globalization construct. The unprecedented access to technology, to information, to knowledge has fueled this activity in ways that we really are just now starting to understand.

[1] Thomas L. Friedman, *The World Is Flat: A Brief History of the Twenty-first Century*, 1st edition, Farrar, Straus, Reese, and Giroux, 2005, ISBN 0-374-29288-4; "Updated and expanded," Farrar, Straus and Giroux, 2006, ISBN 0-374-29279-5

Even though we may find ways to explain it and understand it—what 21st century warfare and deterrence and assurance look like in that environment is a colossal challenge.

In 1999, a gent by the name of bin Laden moved from Saudi Arabia to Afghanistan to the caves of Afghanistan. What the heck are you going to do from a cave? Around the same time, in 1998, a guy by the name of Shawn Fanning—a college student—worked away at his computer writing code trying to figure out how to share music peer to peer; and within a few short months, he was able to capture—with a small organization that he put together called Napster—25% of the profit margins of the record industry. Likewise, a loosely knit alliance called Hamas took on a major regional nation state with credibility.

"When you think about the fall of the Berlin wall in 1989 and Operation Desert Storm in Iraq in 1991, and Afghanistan in October 2001, then back to Iraq in 2003—when you think about tsunamis and hurricanes and typhoons and volcanoes and earthquakes and two pandemics—and all of that occurring well within the short span of less than a single adult life, that should give you pause—because when you look back in history, that kind of activity is really unprecedented. "

What are the implications of all of this activity and how do you start to think about strategy? How do you think about an effective way to manage the constructs of governance in that kind of an environment? What kind of capabilities do you want to have? How is it going to affect culture? How is it going to affect the way we do business? How do you play in this sandbox?

When we started to work our way through these issues at STRATCOM—the new missions and the accelerated activities—trying to understand the model by which we could start to participate in a meaningful way in this environment, the challenge that was in front of us really had little to do with the the traditional approach to business, which had always been: "How can I build this kingdom—how can I turn it from one castle into an empire?" All of the standard "Type A" things that we tend to do as leaders and people really were not going to get us any place.

The simple As and Bs and Cs were that we had a headquarters consisting of 5000 people, we now had five new missions, and we had to build a new structure for managing them—so the typical conclusion would be: "I guess I should be four or five times larger." That did not work for Ma Bell, it didn't work for IBM, and it was not going to work for STRATCOM. We now had a different environment that we had to work in, so we had to move forward in a different way. I will quickly step through a series of attributes to our approach with elevator speeches on each attribute, and I will be happy to let you pick them apart in the Q and A.

Attributes of the New STRATCOM Approach

The first attribute I want to discuss is speed—and then I will examine cyberspace and scale. What is the definition of speed in the current environment? Is it going Mach Two in a fighter? Is it a tank that goes faster, jumps higher? Is that what we mean by speed?

Defining Speed

Where I generally face the biggest challenge in discussions about speed is in trying to bring it into a different dimension for intelligence, surveillance, and reconnaissance (ISR). When we entered into the new construct of two major theater wars with the added consideration of four critical regions, what has always been a limiting factor became even more important: How long does it take to swing intelligence, surveillance, and reconnaissance from one theater to the next?

We in the military start with the issues of getting assets into the new theater: "Okay, I've got to position the tankers so that I can get the aircraft, and I've got to build a bridge so that they can get from one theater to the next. How many days does it take to find the tankers? How many days does it take to move all of the assets to the new theater—get them bedded down, get them ready to go?"

No matter what you do, that process is measured in days that are more than the fingers that I have on my hands (so as a Marine, it is beyond my comprehension). It simply takes a long time to position assets. But the reality is that from space, we are just dealing with a few minutes. In our system of joint military and government and intelligence agencies, there are at least 15 committees between me and those decisions, and each committee gets at least a day to debate it, and they all tend to use their "no" votes rather than "yes" votes. When you get to the theater, the objectives are: find, fix, and finish. So, if it takes me 10 or 15 days just to get the assets there to find—it is simply too slow. It is too slow when you are dealing with the weapon of choice today, which is a short- or medium-range ballistic missile that can pop out, shoot, finish its time of flight, and have an effect in something under 10 minutes easily. So, we are faced with some mismatches that generally stem from the bureaucracy—that conflict with our need for quick response in different theaters.

"How are you going to erect your defense in 300 milliseconds? How are you going to detect that you are under attack and do something about it in 300 milliseconds?"

The concept that we are pushing to any place on the face of the earth in less than an hour isn't about hypersonics—although that kind of speed is certainly essential—it's about how to find something, fix it, and finish it any place on the face of the earth in an hour. It's not only about how fast you can make something fly or how fast you can find a target—it's putting all of the pieces together in an hour. That's the challenge. Technology can find things, get something that far, that quickly—technology can make it precise; but how do you put it all together inside the decision timelines of your adversary? That is at the heart of the issue in the new world with which we are now dealing. It is the decision timelines of the adversaries that we must beat; if we can stay inside of those timelines, we have a reasonable chance of outthinking, outsmarting, and outmaneuvering them.

Cyberspace

Another aspect of how we define speed is a factor that I believe challenges the notion that we can continue to do what we have always done to conduct warfare by merely making it go a little faster—that factor is cyberspace, the "cyber world." Decision cycles inside cyberspace are significantly different; committees do not do well in cyberspace. If an adversary wants to release a cyber virus from Baghdad—and he takes the long route and goes out to geosynchronous orbit and comes back down in Nebraska—he can do it in about 300 milliseconds.

How are you going to erect your defense in 300 milliseconds? How are you going to detect that you are under attack and do something about it in 300 milliseconds? That's the speed that we're dealing with in decision-making and in maneuvering and in command and control as we move through the 21st century. If you do not have a strategy to operate in that environment, if you do not have the technology, if you cannot assess what is happening to you—then you are going to be outmaneuvered.

A major challenge that the cyber environment brings is that it makes geography irrelevant. For the most part, our laws, our governance—the nation-state construct—is based on property—geography. The cyber world does not pay much attention to geographic definitions and constraints. How do you apply the constructs that we have today for governance to cyberspace?

So the issue of speed of decision-making, governance, and the ability to manage requires more than just adapting what we have today to work faster. If we do not understand that and make it a priority, then we will continue to build the next bombers and ships faster and faster, which is pretty much totally irrelevant.

Scale

The next attribute I want to discuss is scale. I tend to use a business analogy to explain the process of scaling for agility. If you are dealing on a global basis, how do you achieve agility—that is, the ability to tailor your activity to an individual actor? That is hard to do strictly from within a single global construct.

STRATCOM has built a taxonomy that says that STRATCOM will be a global provider, but the regional combatant commanders will give us the agility for the transactions with the local actors; they can tailor the tools that STRATCOM can bring to them to the scale needed for that local area and activity. STRATCOM has to provide enough breadth and scalability in that toolset to be compelling.

Most of the transactions that occur between the global provider—STRATCOM—and the regional activity involve "finding the seams." In business, the process most analogous to the STRATCOM strategy is called arbitrage. How do you find the seams, expand them, exploit the discrepancies, and scale your response to the problem quicker than your competitor or adversary can? STRATCOM provides the scale, finds the seams, and helps the regional commander tailor his response—but he provides the agility through individual judgment; he understands the adversary, he can do the lead-turning, he can put the pieces together to make his response effective against that particular adversary.

When STRATCOM dealt in a monolithic strategy called Mutual Assured Destruction, it had one tool. We simply cannot address the world that way anymore. The Quadrennial Defense Review (QDR) and the Nuclear Posture Review and other studies have all concluded that we have got to have a bigger toolset to counter a more diverse threat—a faster emerging threat, an agile threat. I believe that providing a broader set of tools to respond to an ever changing threat requires a critical construct: distributed attributes.

Distributed Attributes

This concept, I believe, is the least understood amongst us in the military. In business, many people define "distributed" as a strategy of buying up all of your competitors, so that once you are established in many different locations, you are distributed. The military equivalent of that is: "I will use some Navy and some Army and some Air Force and I'll have them moving around inside my theater, so now I have distributed attributes." I do not think that is the essence—or the value—of being distributed. To me—and where STRATCOM has taken the command—distributed has more to do with leverage.

If you are a business, and you try to buy up everything to gain the advantage of being widely distributed, generally the oversight and management of your organization become so cumbersome and lethargic that your competitors can soon run circles around you. The same is true on the military side: Headquarters become huge, forces overlap so much that they interfere with one another, and the ability to be agile is lost.

"STRATCOM provides the scale, finds the seams, and helps the regional commander tailor his response—but he provides the agility through individual judgment; he understands the adversary, he can do the lead-turning, he can put the pieces together to make his response effective against that particular adversary."

After talking with many people in the organization as I was coming into the job, we set an axiom at STRATCOM. We will not change a process unless we can improve whatever it is that we are changing by at least a factor of five. We apply our own version of the Disney Principle [the iterative process of dreaming, realizing, and criticizing]—if you cannot improve something fivefold, you are eliminated from the organization. Sounds brutal, but the objective is to prevent building big organizations that will become a hindrance. That is not what being distributed is about.

Let's take the example of ISR. STRATCOM wanted to be able to build an ISR process second to none—global in nature, with the scale, pace, and agility that we needed to fulfill our new missions. We could have tried to build that kind of organization at Omaha. With 10,000 or 15,000 people in 10 or 15 years, we might have come close, although I doubt it. It was much easier to take 200 people out of our headquarters, make them a component of the Defense Intelligence Agency (DIA), and tell them, "go!"—which is exactly what we did, and what we did in all of our functional areas.

Do not build it—distribute yourself, diversify, find a way to leverage off of existing excellence, and then drive it to a pace and a scale that is aligned with whatever your objectives are.

I can accomplish a lot more by tapping an established organization that is already 20,000 or 30,000 strong, already global in nature—by simply placing a couple hundred people in there to drive them crazy and to align them with what STRATCOM is trying to achieve. That is how STRATCOM has moved across all of its mission areas: The DIA has our ISR functionality; the National Security Agency has our cyber functionality; the Defense Threat Reduction Agency (DTRA) does nonproliferation/counter proliferation/consequence-management for us.

We do not send intelligence people into DIA—we take recovering F-16 pilots and warfighters and put them into the organization. A different culture—put it in there. Let them get in and amongst them. Tell them what it is we need—not what they want to give us. That is how STRATCOM is getting leverage. If that strategy results in anything less than a factor of five improvement on what we are doing, we are out of there. Unfortunately, in some cases, that has meant that we have had to tell some organizations: "Sorry, not interested."

Changing the Organizational Culture

Trying to understand where we could gain value and changing the organizational construct to this kind of a model was easy verbally but difficult culturally. The words flow readily; everybody says: "The first thing we have got to do is be joint." So we all sing kumbaya and hug and say: "We are joint. And the last war was the most joint conflict in the world. We've never seen better joint. Thank God there was a river to keep the Marines and the Army apart as they moved north. Thank God that the Army had enough spare radios so they could give them to the Marines so they could talk to each other."

That was our definition of joint. The reality is we are not terribly joint. Beyond that, we have the issue of what I will say is oftentimes more words than substance—integration with our allies in warfighting—really cumbersome, really poorly done. How do you build an organization that from the beginning integrates those two as a precept, and how do you put substance into it? It is one thing to put the idea of functional integration on your marquee, and altogether another thing actually to be able to do it.

STRATCOM is working its way through the issues of distributed attributes and integration, but the biggest challenge is not technology, it is culture. We have got to figure out a way to keep what is valuable in the existing culture and discard what is getting in the way.

Industry and Academia

There are two more pieces that we have endeavored to pull into this activity at STRATCOM that I would like to mention. If you look at history, at least for STRATCOM, I think that we have lost some aspects of our relationships with industry and academia.

The challenge we face is how to bring industry and academia to the table—not as an adjunct or an afterthought—but as integral players, to provide substance to the ideas of plug-n-play and integrated synchronized activities. A possible solution may consist of putting an American industry and an Allied military together to solve problems for which there is no clear authority or jurisdiction, but which might have a significant impact—such as, for example, the Proliferation Security Initiative (PSI), which is working with the international community to deter the spread and use of weapons of mass destruction and their delivery systems.

How do you start to mix and match capabilities for the problems you are really trying to solve; and how do you ensure that these capabilities drive you in the direction you want to go—not set you up for the fight you might not want to have? For issues like PSI, the question is, where do we really want to end up in deterrence? What is the ultimate goal? The failure of deterrence is conflict. So if we are trying to deter, the tools we need in what we call Phase Zero and Phase One are often not battleships and airplanes. How do you start to bring that to the table for the nation so that you can broaden your toolset? The organizational construct is critical for that.

> *"Do not build it—distribute yourself, diversify, find a way to leverage off of existing excellence, and then drive it to a pace and a scale that is aligned with whatever your objectives are."*

I will tell you that we are not there by a long shot; but setting an objective and grading ourselves based on how well we are moving towards that objective helps the organization. STRATCOM is pushing hard on that, and I think that a lot of what we all will be discussing today will center on how to bring about fundamental change in the organizational construct.

Cultural Redux

The last piece I would like to reiterate—and then I will open the discussion to Q and A—is about culture, and how we manage our way through the cultural challenges and the dynamics of change.

We can attend these forums, and discuss these issues from the perspectives of being in the seats to being up here in front; and when we say we have got to change, we look around the room and see all the heads moving up and down. But when you really examine the issue, what you find out is that this change thing is great as long as it doesn't affect you.

How we manage the culture is a lot more about personal dynamics and human demographics and how we work together than it is about assessment of the technology. We are in a bit of a bind right now; and it took us—I go back to my green eyeshade past in the Department of Defense—it took us at least 15 years to go from the Planning, Programming, and Budgeting System

(PPBS) to Planning, Programming, Budgeting, and Execution (PPBE). It has simply revolutionized what we do.

We are stuck in fielding legacy equipment that is "legacy" before it ever hits IOC, and everybody calls it such. That kind of agility is just not going to service well. We must find the interface between the information age and the acquisition practices of the industrial age; and we must transition from the governance of the industrial age. How we do that is critical to whether or not we stay a competitor; and we are not very good at that yet.

Let's consider some command and control acronyms. How do you outsmart your enemy? How do you stay inside their decision cycles? Well, you can build systems like the AFATDS [Advanced Field Artillery Tactical Data System] or the TBMCS [Theater Battle Management Core System]—each letter's about a billion dollars; each letter's at least a year just to change a line of code. What are our adversaries using?—Google, Yahoo, MSN—very agile, updated at least weekly, monthly—clearly effective. So from an acquisition standpoint, if you compare a command and control system built on an information-age model—with systems built on an industrial-acquisition construct that is significantly different culturally—the TBMCS, AFATDS—the standard packages that we have for command and control—who has the advantage?

"We have got to figure out a way to keep what is valuable in the existing culture and discard what is getting in the way."

Assume that the adversaries know who we are, assume that they can tell us what we need to know—because we certainly cannot figure it out on our own. God forbid that when we step across the line of departure, they change things—because our response cannot change; we are locked into our response based on our information. Meanwhile, as the adversary is maneuvering on our flank, he has got perfect information.

How are we going to change that? I do not know what is going to happen when I step across the line of departure. I do not know what the adversary is going to do. But I do know that the adversary is going to outmaneuver me if I don't change. He is going to be there to surprise me and he is going to work in my seams; and I am going to try to do the same to him—and that fight is going to be very dynamic. If my tools and my weapons are not equally dynamic, I lose.

If you sit on the firing line of a network attack activity, a slash is a whole new class of weapon. The warfight changes with a single slash. How are we doing to change the mindset and the culture to start to understand and be able to work in that environment?

Committees do not do well in milliseconds. A basic way of doing business today is: locate a problem, identify it, discuss it, come to some set of courses of action, brief that to at least four levels or echelons of bosses, issue a directive to gather the forces necessary, and then issue the authority to prosecute. The war is over before you have even started.

We are going to have to figure out how to operate in that environment, and it is going to stress the culture more than it is going to stress anything else.

Collaboration

I would like to leave you with a final thought on the issue of trying to move the culture of a large organization. It is an interesting, dynamic task. We at STRATCOM did this initially with collaboration: It is transformational—it just rolls off your tongue, and everybody uses it, and it justifies money, and you can say, "Oh, I collaborated on that. I'm in a distributed organization and I collaborated." Okay, got it.

Rather than develop a multibillion dollar software package, we just took a cheap off-the-shelf commercial product and started to work collaboration processes. How do we define collaboration? If you ask someone my age what collaboration is, they will say it's the number of people that I called on the phone to discuss the issue. If you ask my daughter, it's how many chat rooms that she can run simultaneously. If you ask my grandson, who is three years old, he would say "It's the A key, grandpa. That's the one I push to get automatic VTC with you at night to say good night." Collaboration means many different things to different people, so you have to consider the attributes of the different tools.

Chat rooms are very fast, they exchange information quickly between disparate groups, and you can make connections that give you huge leverage, but you all have to agree to be there simultaneously. The same with the phone. We started to acknowledge the fact that although it is convenient for me to conference at 2 o'clock in the afternoon, my forces in Diego Garcia or in Okinawa do not necessarily like to do daily routine activities at 2 o'clock in the morning. So we moved towards blocks because you do not have to all be there at the same time and you can follow the sun, so to speak, in your activities. Relatively simple. Unfortunately, it does not play well culturally in a military organization.

"We just do not need another 9/11 to compel us to start to compete in this environment. We cannot wait for that anymore. The proliferation of knowledge and access have allowed individual actors to have the throw-weight and the authority and the intellectual capital of nation states."

God forbid that I talk to Lance Corporal Cartwright as a four-star without at least 15 layers of command in between clearing whatever Cartwright said. That is the culture, and we had to find a way to work through the culture and command structure. After we started using the new collaboration channels, during the first six months, that is exactly what happened: An event would be posted with a blog space where you could talk about the event and experts could comment on it, so you could get input from all directions, to help you decide what you wanted to do.

All of that was good, but the inputs were very slow coming in. Why? Because the chain of command had become the chain of information, so everything had to be staffed before being said. Well, it didn't do much for our speed of execution.

So I had to threaten them with the fear of death, and things started to happen a little bit quicker. However, we found in the second six-month period—and it did tend to rotate on six-month periods—that we had a situation called "the tethered goat." That is, Lance Corporal Cartwright would post the entry, but it had been staffed and given to him by the Colonel: "Okay, say this and use my name or use your name."

"God forbid that when we step across the line of departure, they change things—because our response cannot change; we are locked into our response based on our information. Meanwhile, as the adversary is maneuvering on our flank, he has got perfect information."

So, again, I had to use the fear of death: "You either stop that or I fire you," which generally gets their attention. We started to move to collaboration. Collaboration in this flat environment really puts stress on middle management. Middle management owns the process. Their comfort zone and their power resides in their control over process. If you start one of these experiments—whether you are in business or you are in the government—you will come to that realization very quickly.

This little collaboration tool is marvelous; it has got incredible accountability, so you can tell what is happening anywhere in your organization—so you can check out Lance Corporal Cartwright in Shop X by typing his name into the tool and seeing everything that he has done/contributed to. Often, the list is long; sometimes the list is short. You put in Colonel Cartwright's name and there is usually nothing there. Why not, you ask? "I'm managing people." What is that doing for my bottom line? What are you really doing for my organization?

It puts a lot of stress—whether you are that overt about it or you are hopefully more subtle about it—it puts a hell of a lot of stress on middle management. Because they are the ones who will slow the decision down in order to enter into the process—and process gives them security. How you take that on in a large organization—how you take that on in any large endeavor—is really at the heart of how you are going to move forward in this or not. It is a big challenge.

By nature, we do not generally like to change very much. If the world changes, we like to make sure it changes those around us—not us. We just do not need another 9/11 to compel us to start to compete in this environment. We cannot wait for that anymore. The proliferation of knowledge and access have allowed individual actors to have the throw-weight and the authority and the intellectual capital of nation states. That means they do not have to answer to voters, they do not have to answer to a congress, and they can have an incredible effect on you and me.

If we do not find a way to address that problem, we will be in dire straights. I'll leave it at that. The end statement here is that, if we are not willing to flatten out and get to these kind of decision speeds and execution capabilities and integrated agile organizations, then we will be the flattened—and that's just not where we want to end up. Okay? Appreciate it.

As I said, I am happy to let the Q and A go in any direction. I tried to bring up enough issues to irritate the majority of the audience here, so we can go in any direction you want to go.

Q & A SESSION WITH GENERAL CARTWRIGHT

Q: *Sir, could you talk a little bit about the Africa Command with an integrated State Department duty structure?*

Gen. James Cartwright – The question is about Africa Command and where we are headed in integrating State Department and DoD activities. What ideas are being proposed, how could the new command possibly follow a different model? One of the key things that STRATCOM has been trying to understand is the way DoD carves up the world versus the way State carves up the world. The boundaries are not the same. Is that good or bad? Some people think that's good; some people think it adds unnecessary challenge and keeps us from speaking with one voice.

If you have a regional combatant commander for an area and a group of ambassadors for that same area, how do you bring a coherent message, how do you work preconflict-type activities in that environment? We have had some dialogue about Africa Command—whether it will add value to integrate activities between State and DoD from the beginning, or whether it would unnecessarily impinge on checks and balances in the government. How do you approach this problem? My fear is that it will be like the Army and the Marines going north to Baghdad. Although we may have a common name, we might section ourselves off within the organization in a way that will not be value-additive.

The good aspect of this could be that if we integrate, we might find that the people in the State Department really do not all have just one eye in the middle of their forehead, and they do speak English, and we could actually find synergies where we could both add to the equation. The question is: how do you incentivize collaborative behavior?

Immediately, integrating goes against the process owners, so you will have to shift and balance power within the organization. You have to resolve internal conflicts such as who is in charge, when are they in charge, what issues State works on, what issues DoD works on—all of those things. The hope is that you can get them in the room together, close the door, and throw pizza under the door until they all start to behave—and that you will get something out of this that might add value in a way that we have not thought about. The opportunity in Africa is huge. If you can start to shape activities—absent conflict, preconflict—in a way that is coherent, you have a lot of potential there to move in a positive direction. It's an experiment.

It is going to take some senior leadership commitment to make everyone willing to accept new processes and modify existing processes in the name of devising better ways to conduct diplomatic and military activities. They will have to prove that they are more than just a demonstration to be accepted, and they will have to be able to interface in some way with all of the standard processes that will not change in the rest of the theaters.

So I think it has a huge challenge, but if senior leadership is absolutely committed to it—which is the only way that I think it's going to have any chance of succeeding—then it may well yield great rewards. I am hearing the conversations; I just have not seen the commitment yet to really move forcefully in that direction.

Q: *Can you elaborate on the topic of distributed attributes?*

Gen. James Cartwright – I think there are two dynamics to this discussion. There is value in a distributed organization that can move assets to a problem quickly on a global basis and have the appropriate scale associated with each problem; then there is the regional commander who can bring the context and the agility to match the right resource to the exact problem. How do you find the balance between the two? The unfortunate element that tends to muck up all of this is ownership. That is what people focus on: "What do I own? My worth is based on how many planes or sensors or whatever I own rather than what is happening."

I have established a precept at STRATCOM that we adhere to before we approach any mission area: I do not really want to own any resources at STRATCOM. For example, I do not want to own the ISR platforms. What we bring to the table are efforts to understand globally what is out there, what is the problem set, what is the likelihood of matching a sensor to the problem and having some level of success, what is the probability of engagement success. Given that there are competing environments, multiple problems, and not enough sensors to cover every problem, how do you mix and match in a way that gives you the scale that you need to solve a particular problem? Not owning the assets unburdens STRATCOM significantly. Therefore, we stay mostly on the assessment and analysis and global force management side of the equation; we focus on applying these to the problems at the appropriate scale.

What we tend to find when we do this—and we do a lot of assessment activity—is that the ownership issue always surfaces. Here is one example that just drives me crazy that comes out of every single assessment we have done in every theater: A combatant commander asks you for a Rivet Joint. He does not tell you why he wants it. He just wants the Rivet Joint, and he wants it for a period of time—not for an effect, but for a period of time—"I want it for six months."

If you do not give him the Rivet Joint, he does not ask for something else. So, was it the target that he was trying to prosecute or was it the ownership of the asset? I have never had a combatant commander come back and ask for an alternative when we did not give them what they wanted. It bothers me. So, how do you change that? You ask (or tell) the commanders two things:

1. "Tell me what the desired effect is, and then let me offer you a range of solutions—because you are competing with other combatant commanders for the same assets. Let me offer you a range of solutions and a probability of engagement success associated with those, then you can pick and choose or argue or advocate for what you think your priority ought to be."

2. "Define the problem we are trying to solve, and when we solve that problem, time's up. You do not need to own the asset—I need to move it and move it quickly to the next problem."

That is where we have to change the focus. It is less about ownership; but ownership is the prevailing culture. That is really at the heart of the problem. When physical ownership is a priority because it is a way that we gain stature and standing power, it can become self-limiting because you are more focused on the ownership and the management power of that activity than you are on the probability of engagement success and trying to understand what an asset is going to contribute rather than on owning the asset. Ownership is as prime a human attribute as they come, so trying to behave differently is a huge challenge.

Let me give you another example of the assessment role, and a tool we are using. We call them kill webs. Essentially, they are all of the different sets of command and control, sensors, and effects or weapons that would be available to you as a commander. How do you string them together in different combinations to understand the probability of engagement success, match them up, and then solve more with a limited number of assets than you would have by just parsing them out one at a time. The system is not structured that way yet, but that is where we are trying to move it. We think these kill webs—on the output side—allow you to articulate to someone: "Here is the likelihood that this will solve your problem."

When we look at the input side of this activity, we ask, "Where do I always hit a throughput node that causes me problems?" That is where I am going to start to advocate for additional new capability or more of what I already have. It gives you a way of looking at the problem that—analytically and from an assessment standpoint—allows you to articulate very quickly what the input equation ought to look like and what the output equation should yield.

That is the way we approach a problem, whether it is ISR or Strike or Net Warfare. We develop kill webs that allow us to understand the input side and the output side so that we can move quickly.

The problem is that at the end of it, the organization still tends to be more focused on ownership than it does on the product. That is the culture that we have got to try to break somehow. From my perspective, I do not want to own the assets and centralize ISR. STRATCOM is focused on what are the connections of opportunity, which ones take how long and what is the likelihood of engagement success. When I look at the enterprise, I am asking, "Where will I get the greatest leverage at my next acquisition?"

Q: *Do you have a problem in matching your goals to the culture of the Congress?*

Gen. James Cartwright – Oh, very much so. The problem is not in their acceptance of the methods—it lies in the committee structure, it is in the lack of agility, to move adaptively. Congress deals in one-year increments—that is a heck of a lot better than having to justify everything for five years at a time. When people always point at the Congress as being the roadblock, my response is you ought to carry a mirror every time you accuse somebody of being a problem; because you are probably a major part of that problem. Because of the committee structure, they have had a heck of a time determining which committee STRATCOM should advise. The problem with the committee structure is trying to understand where the lines were between these disparate missions. A major part of my activity is shuttling between the intelligence committees, the standing committees, the armed services activities, energy, and water, all of which have oversight of the various mission areas. How do we reach consensus? How do we move something forward? If one committee goes left on you and the other one goes right—trying to square that is very difficult.

Congress is very aware of this challenge, and to their credit, they are working very hard to align across the committee structure. This year they have moved in a way to allow me to focus my consideration in three committee areas, down from nine last year. They have moved in a constructive, accommodating direction. They understand the opportunity and they're trying to reinforce the behavior and keep programs aligned so, for example, you actually have a delivery platform for a weapon or the other way around. They have moved much more aggressively than probably even the DoD has on trying to help with alignment issues.

Q: *You talked quite eloquently about the value of speed in terms of added capability. Part of the fitting together that you talked about is making good decisions within an extreme timescale. In the past six years, what opportunities have we had to further develop that capability?*

Gen. James Cartwright – Opportunity is a double-edged sword. One of the things that we have worked very hard in missile defense and in prompt global strike is how do you—in the span of an hour or in the case of missile defense, in a six-minute decision timeline—how do you move to decision speeds in that timeline that are more than just the decision of yes or no weapons release or not? How do you actually get senior leadership to understand the gravity of the issue in those timelines and be able to add value?

It goes back to the collaboration discussions. I cannot guarantee you that the decision will be good, but let me give you a sense of what happens today versus where we would like to be. Today we would convene a conference on the phone and say, "Problem X—I am trying to get some place in an hour; I am trying to make a decision in four or five minutes." We spend the entire time in discovery, briefing somebody with PowerPoint or voice about what is happening—instead of spending that time asking if I do this what is the nuance, what are the second- and third-order effects, what assessment has been done that would give me a model to understand what I'm about to enter into? You cannot do that by voice—not in those timelines.

". . . if we integrate, we might find that the people in the State Department really do not all have just one eye in the middle of their forehead, and they do speak English, and we could actually find synergies where we could both add to the equation."

We are trying to move national command capabilities to provide tools that give you the situation awareness either with a picture—whatever makes an individual cognizant of what is going on—and to do discovery very, very quickly and spend the rest of the time understanding the implications and talking about that, rather than listening to somebody brief you about what is happening. That is a huge change in the way we do business.

Essentially, it means that the processes are running based on a rule-set and people are intervening by exception. When they intervene, it is giving them the time to think about alternative courses of action, second- and third-order effect-type activities instead of weapons release. It enables them to ask, "Am I in part of the envelope, am I not in part of the envelope. How many seconds have I got left to make a decision?"

Technically, it is relatively easy, but it is hard culturally to get decision-makers to work in that way, and it is hard to get forces to—in the missile defense example—it is hard to get all those layers across nine time zones to not want to manage every sensor interaction, which would give you a stackup of time that would make the shot irrelevant, or the defense irrelevant—and instead have someone sitting there saying, "It looks good, I see no reason to intervene, and letting it pass through."

The issue is not whether or not we can cause the effect and actually deliver something globally—we should focus on what are the implications of being able to do that and what are the regret factors of not being able to do that. Do I balance those and what are my other choices? We need to be able to think about it beforehand rather in the heat of conflict.

That is really the debate on prompt global strike. I think you want to have an alternative in prompt global strike to a nuclear only option. However, once you have this capability, what are the implications? Am I going to enter into conflict or incite or escalate in that activity unintentionally? How can I portray this capability and take me in the direction I want to go, which is to deescalate?

How do you start to understand? Because technology can give you some wonderful tools, but at the end of the day it still boils down to: what is the perception of your adversary, how are you trying to change that perception, and which direction do you want to change it in—and what is the likelihood you are going to be successful at doing that? These are huge, huge debates that ought to occur.

So, to the credit of the Congress and the Department and the Administration, in my mind—many of these debates are starting to be public, which I think is a good thing— including the nuclear debates. I think it is critical to start to get these things up on the table and let people talk about them. Without being able to do that, you are really challenged.

1.2 “KNOW YOUR ENEMY”—THE IMPORTANCE OF SUN TSU’S ADMONITION

Bruce Hoffman

If there has been one consistent theme in both America’s war on terrorism and our melancholy involvement in Iraq it is a serial failure to fulfill the timeless admonition to “know your enemy.”

The war on terrorism has now lasted longer than World War II and our entanglement in Iraq for nearly as long. That we are still equally far from winning cries out for precisely the knowledge that we have instead neglected. “If you know the enemy and know yourself,” Sun Tsu famously advised centuries ago, “you need to fear the results of a hundred battles.” Yet, what remains missing five and half years into this struggle is a thorough, systematic, and empirical understanding of our enemy: encompassing motivation as well as mindset, decision-making processes, as well as command and control relationships; and ideological appeal as well as organizational dynamics.

Why is it so important to “know our enemy?” ... Simply, without knowing our enemy we cannot successfully penetrate their cells; we cannot knowledgeably sow discord and dissension in their ranks and thus weaken them from within; nor can we think like them in anticipation of how they may act in a variety of situations, aided by different resources; and, we cannot fulfill the most basic

Professor Bruce Hoffman is a tenured professor in the Security Studies Program at Georgetown University’s Edmund A. Walsh School of Foreign Service and former Corporate Chair of Counterterrorism and Counterinsurgency at the RAND Corporation. He also served at the Office of National Security Affairs, Coalition Professional Authority, Baghdad, Iraq, during the spring of 2004. He is the author of Inside Terrorism (Columbia University Press), May 2006.

requirements of either an effective counterterrorist strategy—preempting and preventing terrorist operations and deterring their attacks—or of an effective counterinsurgency strategy—gaining the support of the population and through the dismantling of the insurgent infrastructure. Until we recognize the importance of this vital prerequisite, America will remain perennially on the defensive: inherently reactive rather than proactive—deprived of the capacity to recognize, much less anticipate, important changes in our enemy's modus operandi, recruitment, and targeting.

Forty-five years ago, the United States understood the importance of building this foundation to effectively counter an enigmatic, unseen enemy motivated by a powerful ideology who also used terrorism and insurgency to advance his cause and rally popular support. Although America encountered many frustrations during the Vietnam conflict, a lack of understanding of our adversary was not among them. Indeed, as early as 1965, the Pentagon had begun a program to analyze Vietcong morale and motivation based on detailed interviews conducted among thousands of guerrilla detainees. These voluminously detailed studies provided a road map of the ideological and psychological mindset of that enemy: clearly illuminating the critical need to win what was then often termed the "other war"—the ideological struggle for the hearts and minds of the Vietnamese people. Even if the fundamental changes required in U.S. military strategy to overcome the Vietcong's appeal went ignored, tremendous effort and resources were devoted to understanding the enemy.

"Until we recognize the importance of this vital prerequisite, America will remain perennially on the defensive: inherently reactive rather than proactive—deprived of the capacity to recognize, much less anticipate, important changes in our enemy's modus operandi, recruitment, and targeting."

Today, Washington has no such program in the War on Terror in Iraq. Both America's counterterrorism and counterinsurgency strategies appear predominately weighted towards a "kill or capture" approach, targeting individual bad guys. This line of attack reflects a fundamentally conventional military's preoccupation with the "enemy centric" warfare it has long been accustomed to, trained for, and ineluctably prefers to fight rather than the "population centric" approach that is at the heart of countering terrorism as well as insurgency. It is also erroneously based on the assumption that America's contemporary enemies, be they al Qaeda or the insurgents in Iraq, have a traditional center of gravity, thus believing that these enemies simply need to be killed or imprisoned so that global terrorism and the Iraqi insurgency will both end.

1.3 THE ACHILLES' HEEL OF ANALYSTS

Michael Bauman

INTRODUCTION

TRADOC [U.S. Army Training and Doctrine Command] is working on three or four dozen studies and analyses at any one time, from tactical distributions systems and new trucks to convoy protection. We are finishing a study on the Joint Light Tactical Vehicle and making another annual run on Future Combat Systems. We just completed a Precision Munitions Mix Analysis, which won a Wilbur Payne Award, and the Unmanned Aerial System Mix Analysis. The most pressing analysis underway right now concerns the Army's Tactical Ground Network.

Our diverse body of work over the years has taught us that concepts are typically ambiguous, the data bases are miserable to work with, and the models are inadequate to the task. Furthermore, because of the compressed schedule of the work, we have to build methods and models in stride with the analysis and try to analyze data on the fly. It is a very tough business, and

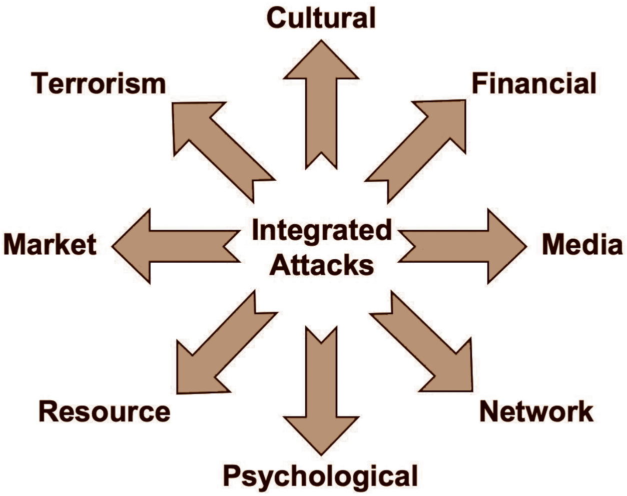
Mr. Bauman leads the analysis mission of the U.S. Army Training and Doctrine Command (TRADOC) and serves as the Director of the TRADOC Analysis Center (TRAC). Under his leadership, TRAC has been prized with thirty-six major DoD and Army awards for excellence in analysis. During the past two decades, his agency's analysis has enabled nearly every major Army force transformation and weapons acquisition. He received a Bachelor of Science in Aeronautical Engineering as a Beech Scholar and a Master's in Industrial Engineering (Operations Research) from Texas A&M University. Mr. Bauman has been recognized three times with the SES Presidential Rank Award and received the Army's Wilbur B. Payne Award for leading the Future Combat Systems Analysis of Alternatives.

it offers valuable insights to how we must analytically approach unrestricted warfare in the future.

A DIVERSE ENEMY

The CIA translation of *Unrestricted Warfare* by the two Chinese PLA colonels, Qiao and Wang, clearly reveals how unrestricted warfare is different from conventional warfare (Figure 1). The premise of their writing is that the militarily inferior can win against the militarily superior.

Unrestricted warfare attacks will be integrated and target the domains represented in the figure. That view has profound implications: the authors do not see a nation like China necessarily competing with us as peers or superiors militarily, and they do not believe they have to.



Col. Qiao Liang & Col. Wang Xiangsui, *Unrestricted Warfare*, Beijing: PLA Literature and Arts Publishing House, February 1999. English translation, Pan American Publishing Co., 2002.

Figure 1 Unrestricted Warfare

Soldiers are not the only ones that wage war—there are counterfeiters, hackers, black marketeers, and free trade violators. All these actors compose “the army” that is waging all aspects of unrestricted warfare. In fact, attacks are going on right now within many of the domains represented in the figure. Are they coherent and integrated? Probably not. But various state and non-state actors are repeatedly probing in these domains. As Dr. Luman noted, there is only one rule in unrestricted warfare: there are no rules. However, the absence of rules doesn't mean we cannot perceive and analyze patterns in the behavior of those who are conducting these attacks.

IMPLICATIONS FOR ANALYSTS

The 2006 URW Symposium was excellent in its scholarly attention and exploration of what URW suggests for the community of modelers, analysts, and data gatherers. In his talk, entitled "Tailored Deterrence: New Challenges for the Analytical Agenda," Charles Lutes mentioned six key features of URW:

1. Nonlinear
2. Expanded time domain
3. Inherent dynamism within the system
4. Informational, cognitive, behavioral aspects
5. Immense diversity of targets and tactics
6. Contextually rational behavior of enemies (vice shared values and norms)

He concluded that the methods that an analyst uses to evaluate warfare are insufficient to evaluate unrestricted warfare.

One particularly interesting point is the contextually rational behavior of the enemy. In other words, we may not understand them to be rational; but within their own context, they are. If we do not understand that, we cannot treat the enemy properly in our body of work. Lutes also said that we need a renaissance of thinking and a new generation of luminaries. He talked about three steps for analyzing this kind of enemy: elucidate, estimate, and then evaluate as we move into this environment. Finally, he called for a shift in perspective that leads to new ways of connecting data and interpreting exhibited behavior.

The theme of this paper is data—interpreting, collecting, and connecting the data and interpreting and predicting the behaviors that we see in this new environment. At last year's symposium, Blackett's Circus was twice cited as an early example of the kind of operations research that URW demands. Blackett was the British astrophysicist during World War II, who led a multidisciplinary team in determining where to base the radar-guided guns for coastal defenses. Blackett's success showed that, to understand an environment, we need to analyze the data to examine possible influences, explore relationships, and eventually mathematize them. In other words, if we are going to address URW, we have to understand what we are working with. We must observe, gather data, theorize, develop hypotheses, and test them against the data. Someone characterized this as "data intensive casework," which is particularly apt. To paraphrase a paper from the 2006 URW Symposium, we have to manifest the value of information in our force-level work.

" . . . to understand an environment, we need to analyze the data to examine possible influences, explore relationships, and eventually mathematize them."

At TRAC, we have been able to model the layers of the network in excruciating detail at the force level, especially for brigade operations. We can generate and track discrete messages all the way through the system to the points where decisions are made using the information represented by these messages, and those decisions have traceable impacts on tactical and operational outcomes. It represents an Army modeling and analysis enterprise that few, if any, organizations have been able to duplicate. It requires very meticulous, very detailed work and very precise performance-level renderings of networks. But those networks are a manifestation of the physical world of warfare, and the outcomes are almost exclusively kinetic; they do not yet adequately account for the cognitive and behavioral aspects of military operations.

What has been done to date with new network concepts is enormously exhausting in terms of the intellectual work, the tedious business processes, and the complex modeling that have to be built-out and continually updated as the network changes. This set of challenges is but a glimpse of those facing analysts of URW.

COMPLEX ADAPTIVE SYSTEMS

Table 1 is a list of some of the features of complex adaptive systems, which apply to unrestricted warfare. These systems are difficult to work with and require a lot of data to achieve acceptable accuracy and predictability. I do not know of any cases in the Army where we have applied complex adaptive systems successfully. Complex adaptive systems have not yet been proven for the kind of problems we are facing—for example, where do we define the boundaries? If we keep trying to identify all the interrelationships, the cost keeps growing, and soon—to quote a familiar adage—we find ourselves trying to define the universe and present three examples.

Table 1 Complex Adaptive Systems

- Many interacting elements.
- Causality is complex and networked.
- Number of plausible options is vast.
- “Intelligent” context-appropriate behavior.
- System behavior is coherent (exhibits recurring patterns) but not fixed (the rules keep changing).
- Diverse, flexible responses towards any given end.
- Agility (rapidly change tact to be more effective).
- The system learns from experience.
- Predictability is reduced.

Holland, “Hidden Order: How Adaptation Builds Complexity,” 1995.
Grisogono, DSTO, Australia, 2006 C2 Research & Technology Symposium.

How do we define the problem and find the data needed to analyze it? The system behavior is coherent. The system can exhibit recurring patterns, but the rules keep changing. If there are enough data, a pattern can be discerned and analyzed even if it is shifting. The system is going to react to outside stimuli and try to find a way to always be successful despite barriers. It is going to learn, it is going to adapt, and it is going to keep changing. To use such a system in the work that we are doing, we have to have robust data and a very robust feedback loop built into the complex adaptive system that we are modeling so that we can keep up with the adaptations in the URW environment.

We are not adapting fast enough, but our adversaries are. The models that we build today are very difficult to change and very difficult to adapt. We need to search out new ways to represent this environment of unrestricted warfare. As Holland noted in *Hidden Order: How Adaptation Builds Complexity, "an initially poor predictor will improve over time as feedback is used to refine the models . . . "* In other words, our URW model cannot be static. We have to design a model that will dynamically adapt as we tap the data base and understand what it is telling us. As we weigh how to analytically tackle the dimensions of URW, the use of complex adaptive systems deserves much more attention.

GROWTH IN DATA: AN OPPORTUNITY

Figure 2 shows the amount of digital data in billions of gigabytes that is expected to be generated worldwide by 2010. Leveraging this volume of data to our advantage is an enormous opportunity and, in my view, warrants a DARPA-type approach. There is already an enormous wealth of data freely available and readily accessible in many forms from a variety of sources. As a topical example, law enforcement agencies have begun monitoring YouTube for clues to crimes; and that is just one example of many. What are we doing to tap into these enormous data bases and use them to our advantage to ward off potential attacks on our nation?

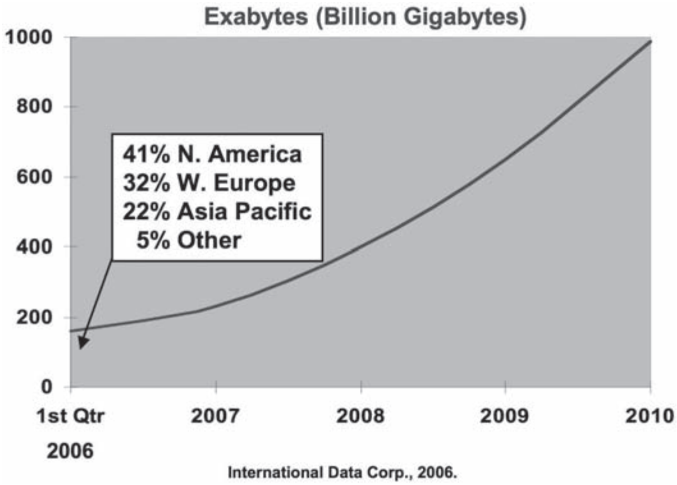


Figure 2 Digital Data Generated Worldwide: 2006–2010

BGI—Barclay's Global Investors—is a classic data quantifying organization and an outstanding example of how to manage and exploit data successfully. It is America's largest group of money managers, with $1.6 trillion under management. Its original claim to fame was that it invented the index fund. Its goal is to systematically beat the market by harvesting the alphas—the gains above market return. In the past 5 years, it has generated $20 billion in alpha. It is successful for several reasons:

- It employs over 100 PhD statisticians, who are credentialed in financial engineering, physics, applied math, and operations research.
- At any given moment, it is working on 50–60 new alpha theories, comprising scores of new statistical factors.
- Theories are tested against terabytes of historical data that are continuously updated.
- Techniques are derived from fuzzy logic, neural networks, Markov chains, and nonlinear probability models.
- It executes thousands of trades per day on more than 12,000 stocks and debt issues, based on continuous number crunching.

What is more important, creating wealth for your customers or defending the nation? Obviously, the litmus test for being a successful data manager and miner is creating "wealth" for your clients. Here is an example where the equities market has maintained, developed, managed, and made available in a matter of milliseconds enormous amounts of data to a wide variety of money managers so that they can create wealth for their customers.

We have nothing comparable in DoD. Yet, in the financial sector, there is a treasure of very valuable data accessible to everyone. These sector companies hire the best and brightest from the leading institutions and pay them very handsomely, but many of these financial specialists seek out those companies because they are at the cutting edge of research in their fields.

Barclay's is incredibly successful, in large part, because of its mining of data bases. Its leading experts posit theories about where they might be able to harvest alphas. They look for trends in the marketplace that offer potential gains above the market. Then, they vet and debate their hypotheses with their colleagues and test their theories based on historical evidence by tapping into BGI's terabytes of data. In other words, they seek compelling hypotheses and subject them to hard data. As a recent issue of *Business Week* reported about Barclay's, *"If a thing cannot be measured and factored into a hypothesis for testing against historical data, Barclay's has no use for it. They have essentially purged human fallibility from the system."*

BGI is an excellent study of how a profit-motivated organization has prospered by tapping into a very rich data base even when those same data are available to its competitors. The last paragraph out of the article from *Business Week* makes a great analogy—it calls BGI:

> *. . . the Wall Street equivalent of one of those giant factory fish trawlers that have revolutionized commercial fishing. This superquant methodically cruises global markets, sucking alpha from the depths while everyone else drifts about in rowboats, corks bobbing pathetically atop waters that are nearly fished out.*

That is a wonderful summary of what Barclay's is doing with data mining. There is only about $30 billion of alpha out there for all of us, and Barclay's is reaping about $5 billion of it—the direct result of an extraordinary data mining enterprise.

OIF DATA BASES

Now let's turn to our military's most ambitious operations data base, one that is relevant to URW, albeit in a far less grander scope and scale—the data being collected in-theater for Operation Iraqi Freedom (OIF). This evolving data enterprise is not nearly the scope or scale of BGI's, which should be of great concern to us given the hardships it already faces.

The OIF data are collected in a data base called the Combined Information Data Network Exchange or CIDNE. This data base collects three types of data: operational data; polling data, which have a kinetic focus; and assessments by subject matter experts (SMEs). The data are in raw form and are input by numerous parties, including the Coalition Forces (CF) and the Iraqi Security Forces (ISF). Those data are not integrated within CIDNE; they're entered separately and remain separate or non-relational. Little or no political, social, economic, or infrastructure data reside within CIDNE; and there is no strong data czar in total control, although Multinational Forces Iraq (MNFI) issued a memo recently that put a knowledge management (KM) officer in charge of the data base, albeit with limited real authority.

Each of the 150 or so fields in CIDNE is assigned to various offices in a lead or support role. To add new data fields to CIDNE, the Corps Commander sends out a fragmentary order (FRAGO) to input new data. However, when he did that recently, some summarily ignored it, for a variety of good reasons owing to the regimen of real operations.

What eventually make these data valuable are downstream data bases that are created by "cleansing" the CF and ISF data. For example, every Friday, a team from the Center for Army Analysis (CAA) updates the data from the two previous weeks. By noon on Saturday, any authorized person can tap into the network and conduct analysis. The system is getting better thanks to the Herculean efforts of a few individuals, but it is still far from what we need to effectively wage war in a URW environment. Our OIF data base experience tests our patience and exposes weaknesses in how we collect, manage, and mine data in a complex environment resembling aspects of URW. Also, the data are largely kinetically focused. What about all of the other dimensions of unrestricted warfare? How do we get all those data in the data base? Who is going to be in charge? How do we manage security and classification issues when data with multiple classification levels are all in one data base? Who should have access so that the quants of our military can test their theories and make them available in defense of our nation?

"CIDNE collects three types of data: operational data; polling data, which have a kinetic focus; and assessments by subject matter experts . . . Little or no political, social, economic, or infrastructure data reside in CIDNE; and there is no strong data czar in total control."

Another issue is trust among different government agencies. At present in Iraq, DoD cannot access the State Department network to download or upload data. The only way DoD can enter data in the State Department network is to key them in. This present day lack of coordination and connectivity offers a glimpse of future challenges in fully leveraging a comprehensive data base spanning multiple agencies and domains for purposes of analyzing URW.

SOLUTION: LEADERSHIP, INVESTMENT, DATA ENTERPRISE

Three resources are critical to solving this problem:

- Enlightened, take-action senior leaders.
- Money, lots of it.
- An unprecedented data enterprise.

It has been very difficult to convince senior leaders in the Army to invest in models, simulations, and data bases of emerging network-centric concepts. That experience is a harbinger of what to expect for URW. We need enlightened, take-action senior leaders who will understand the need for a whole new business enterprise associated with modeling and analysis.

In 1991, Paul Davis and Don Blumenthal of RAND wrote a paper, entitled "Base of Sand," which criticized military models as woefully inadequate to represent the emerging concepts of that time. Davis followed up in 2001 with "Effects-Based Operations: A Grand Challenge for the Analyst," which made the same point: the then-current methods of modeling and analysis were inadequate for effects-based operations, and new theories and methods and a new empirical base should be vigorously pursued. Today, we are hearing the same criticisms that we heard 15 years ago. Will we hear the same thing years from now when we are in the midst of unrestricted warfare?

Our leaders must be willing to provide sufficient funding for a new modeling and analysis enterprise. Otherwise, we have to scramble to keep up with the changing environment. It is unlikely that corporate DoD is going to make the kind of investments that are needed without enterprise-wide agreement. In 5 years, there will inevitably be some new criticism of modeling and analysis. Although there will also be some improvements, we will not be totally prepared to deal with what might arise in the future.

"It has been very difficult to convince senior leaders in the Army to invest in models, simulations and data bases of emerging network-centric concepts—a harbinger of what we face for unrestricted warfare."

It is our responsibility to educate senior leaders about the importance of addressing these challenges. Whatever modest success we have had in representing the new networked concepts and operations has happened because we convinced a few key senior leaders that they need to invest in this area. Further progress is going to take financial commitment. If we're serious about confronting unrestricted warfare with modeling and analysis to determine what capabilities to invest in, how to analyze operations in real time, predict what our adversaries are learning and will do next, adapting our strategies and tactics ahead of our enemies, then we need significant funding and talent—perhaps seeded by DARPA.

Finally, that commitment of resources and effort must result in an unprecedented data enterprise that will turn the DoD modeling and analysis community into the Barclay's of defense.

CONCLUSIONS

Huge quantities of diverse data are going to be readily accessible in the future that will cross over all the domains of unrestricted warfare. The sobering question is this: will we be the ones that most effectively exploit those data and do it first to our advantage, or will that prize belong to our adversaries?

Q & A SESSION WITH MR. BAUMAN

Q: *You mentioned the challenge of encountering thousands of exabytes of data on the Internet. The challenge versus, say, Barclay's is that there's no standard metric for what you're searching for. How do you decide what you want first?*

Mr. Michael Bauman – I agree with you. What is the strategy? What goals are our senior leaders establishing for how we conduct operations? What is a campaign in unrestricted warfare? What goals have we set so that we can establish those metrics? The goal at Barclay's is to make lots of money, but supporting that goal is a lot of subordinate metrics, like cash flow and pre-inventory levels, which sound very arcane to us.

What are our objectives here? What is our strategy? What are our goals: Containment? Deterrence? Defeat through attrition? Hearts and minds? Control of the information operations campaign? Our senior leaders have to provide that kind of direction at a national level.

I would like to follow upon what was said earlier. One of our problems with Information Operations (IO) at the strategic level is that different groups are all working independently on pieces of the same problem, and they don't coordinate well. But it's much more than that. The IO campaign has to go from the strategic level down to the tactical level. The relationships among activities at all levels have to be understood to wage an effective IO campaign. How do we build the processes and understand the patterns so that we can effectively do that?

Let me mention something that's going on in-theater right now. III Corps approached us and asked us to help them determine if they were collecting the right data and had the right measures to gauge whether they were achieving their campaign objectives. Over the course of many years, they had developed a lot of objectives, a lot of metrics, and a lot of data attributes that they were collecting. But nobody was checking to see if the measures actually told them if their actions were having the desired effect. There has to be feedback in the system that indicates whether or not a specific action will lead to the desired outcome. We're helping III Corps in-theater to understand which of those metrics are relevant to what they've established as desired effects.

What we haven't done is collect the data that are most relevant and then conduct statistical tests to establish how strongly those measures are correlated with desired outcomes. The units are rolling through the theater and back out; and every time one leaves, there are more measures left behind requiring more data to be collected. But the correlation is missing. We have to have that feedback in a system like this because we don't understand what's at work. It's not kinetic. It's very unusual for us as military analysts to deal in this environment. So we've got to first understand it. And you must have data to do that.

Q: *You talked about various resources needed for this program. One of the things that I don't see is training of new, potential leaders. They're going to have to get smarter to do this stuff, particularly in the time involved.*

Mr. Michael Bauman – Do you mean military leaders?

Q: *The whole group of people who is responsible for decision-making in wartime.*

Mr. Michael Bauman – It's gratifying that General David H. Petraeus and General William S. Wallace are both leading a new generation of officers and Soldiers. Their influence is reflected in the Army's new manual on counterinsurgency, published by TRAC's parent command TRADOC. It addresses the behavioral aspects of the environment we're working in today, often referred to as the human dimension. In fact, some papers have been published within the last couple of weeks on the human dimension; and conferences are planned. A few years ago, General Wallace hosted a conference that assembled social scientists and anthropologists with warfighters to explore the kind of environment we're operating in today. On the military side, at least through the senior leader development programs that exist in the Army, we're educating a new generation of military leaders.

I can't speak to what's going on in the civilian sector. In DoD, many come from industry. Some kind of program is going to be needed to bring them onboard intellectually. There's a lot of ignorance about this problem even in my own organization as well as throughout DoD. It's going to take education and training to remedy.

At least in the Army, we're seeing a lot of traction in educating leaders. I think there will be a future generation of Army leaders that understands it much better.

Q: *What do you do about data overload?*

Mr. Michael Bauman – Do you mean in the sense of an analyst being data overloaded?

Q: *Yes.*

Mr. Michael Bauman – That's a real problem. But again, I believe we're going to have to turn to software to help us with that. Still, at the end of the day, somebody has to sit down and look at what that software is telling us and figure out if it makes sense in explaining why things are the way they are.

Barclay's challenge is that it still takes a human being, someone knowledgeable, to decide whether or not the product of the data mining, software tools, and the mathematization of the data makes sense. If it doesn't pass the so-what test, it's worthless. A marriage of software with human intelligence and skills can help with that problem.

However, if you're talking about overloading Commanders with data, that's a whole other problem that needs to be treated with much more sophisticated man-machine interfaces. I have joked that we ought to have Windows for Warfighters, enabling commanders to carry around their own portable, customized version of battle command software, tailored like Microsoft Office enables, to access data in the way that's most comfortable to them, adapting it as they grow throughout their professional careers.

Q: *Do you give the Commanders a one-paragraph executive summary?*

Mr. Michael Bauman – You're asking a question about the whole analysis business enterprise. I don't think it's possible to do that for the complex problems that TRAC most often analyzes. Our shortest executive summaries are typically several pages long. I haven't produced a one-paragraph executive summary in a long time.

I wouldn't take any executive summary to a senior leader if I didn't know what he'd ask in the first place and if I didn't have an answer to his question. My organization is not in the business of expanding the body of scientific knowledge, nor are we in the business of trying to defend the so-what of anything. TRAC is in the business of answering hard questions about complex problems posed by senior leaders. We try to do the analysis right and deliver the answer based on the evidence we have. The Commander wants to be confident you did the analysis right, and that takes more than one paragraph.

1.4 TECHNOLOGY POLICY MESSAGE: ADAPTING TO URW

Anthony Tether

INTRODUCTION

The following is a transcript of a speech given by the DARPA Director, Dr. Anthony Tether, at the 2007 URW Symposium. The transcript has only been lightly edited and should be read with that understanding.

DARPA is actually a very small organization, roughly 240 people comprising about 140 or 150 technical people. Only about 2% of our budget is used for agency operations; the remaining 98% goes to industry and universities. That means that we count on all of you for ideas.

What makes DARPA different than any other place in the world is that, by design, the program managers have been there for only a very short time—four to six years. They come from industry, universities, and government. If they are in the government, they

Dr. Anthony Tether founded and was CEO and President of the Sequoia Group, which provided program management and strategy development services to government and industry. From 1994 to 1996, he was CEO for Dynamics Technology, Inc. From 1992 to 1994, he was Vice President of Science Applications International Corporation's (SAIC's) Advanced Technology Sector and then Vice President and General Manager for Range Systems at SAIC. Before that, he was Vice President for Technology and Advanced Development at Ford Aerospace Corporation. Dr. Tether has served on Army and Defense Science Boards and the Office of National Drug Control Policy Research Committee. He received his Bachelor of Electrical Engineering from Renssalaer Polytechnic Institute. He earned his Masters and Ph.D. in Electrical Engineering from Stanford University.

have to give up their career status and become term employees. There are no careers at DARPA. We hire people for their ideas. They give up a lot; come to a place where they know they will not have a career; and sometimes, with the new ethics laws, are not sure they can get a job when they leave. But they all have one thing in common—they have an idea that they could not work on where they were. DARPA gives them that opportunity.

We have one organizing principle: if you put people with like interests together, after a while, they will start to like and trust one another. When that happens, you get a nonlinear effect in the generation of ideas. That is really what DARPA is about. If you want to know what is going on at DARPA, do not look at the titles of the offices; look at the topics under them. We try to create these offices with topics that are multidisciplinary. Even though the technical people might cluster around their own disciplines, they cannot help but meet people in associated disciplines.

THE DARPA MISSION: BRIDGING THE GAP

Where does DARPA fit in? The science and technology programs for the Armed Services tend to be near- to mid-term programs. This is great science and technology but it typically deals with known systems and concepts—making radars more sensitive, jet engines more efficient, and so forth. That should not be a surprise—people tend to put today's problems at the top of a list rather than future problems. So when the funding line is drawn, what usually survives is on the near to mid end.

But there are folks on the far end who will say, "We can move atoms around. Tell me what you want, and I will create the material for it." For them to be funded, they have to be like an electron and tunnel their way across this gap. President Eisenhower created DARPA nearly 50 years ago for one purpose: to bridge that gap (Figure 1).

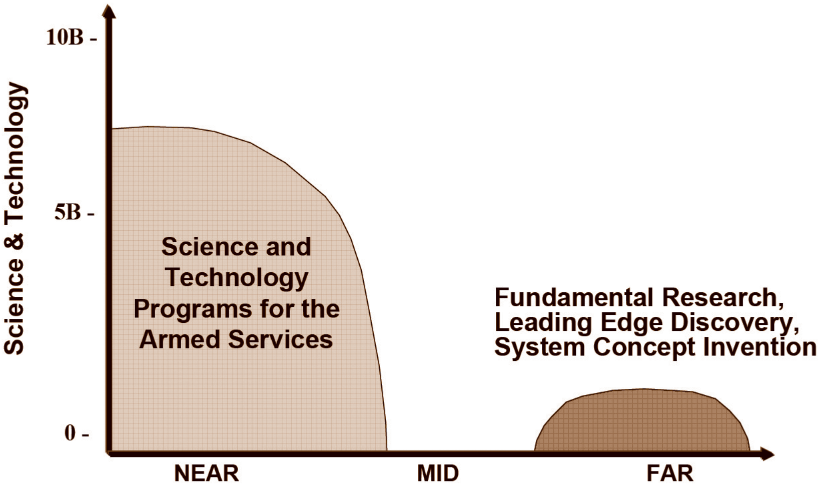


Figure 1 DARPA's Role in Science and Technology

When the Russians beat us into space, it was an embarrassment for this country, especially because it was the geophysical year, when we were supposed to go to space. When President Eisenhower asked how that happened, he found that it just wasn't high enough priority. But there were plenty of people out here on the far end who said, "If you wanted to go to space, we could have done it. But you had to give us the money." So DARPA was specifically created to never let that happen again and was chartered to mine the far side, find those ideas and concepts that could be taken from the far side to the near side, and then pass them on for development.

50 YEARS OF ACCOMPLISHMENTS

What have we done in 50 years? Figure 2 shows some of the programs that DARPA brought from the far side to practical development. They range from Saturn to Global Hawk and Predator. What will DARPA do in the future? I am going to highlight just a few of the ones that are most relevant to this symposium's theme of unrestricted warfare.

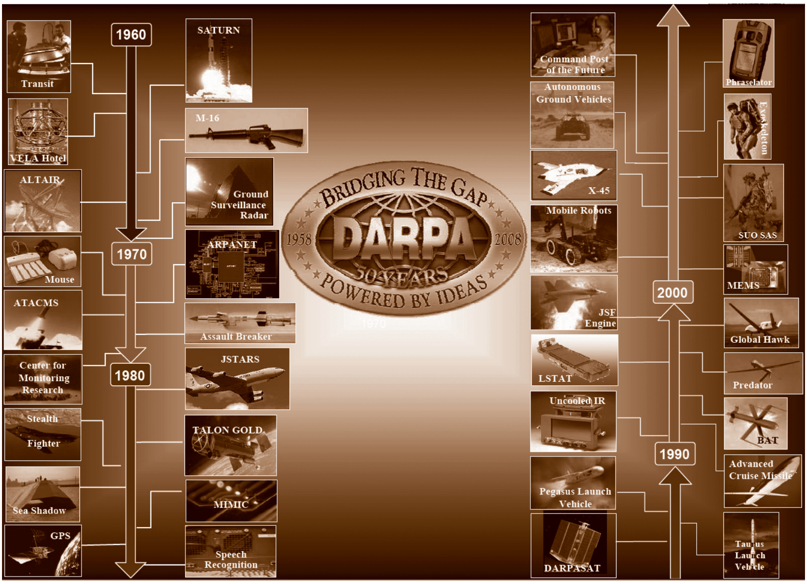


Figure 2 DARPA Accomplishments

SUPPORTING THE WARFIGHTER

The next few figures describe some of the DARPA programs that are supporting our warfighters in Iraq today.

Defensive Systems

The Bar Armor Counter RPG System (Figure 3) prevents an RPG [rocket-propelled grenade] from forming its jet when it pierces a vehicle. It is not 100% effective, but it does it well enough that the enemy in Iraq no longer fires RPGs at strikers with the bar armor.

Boomerang is a system that detects hostile fire. When DARPA developed it in the 90s, the Army said that there wasn't a requirement to know that they are being shot at while on the move. In 2002, General Alexander called me and said, "I've got guys coming back, their vehicles are all shot up, and they don't even know they're being shot at. Can you help?" And we did. BBN resurrected Boomerang and produced the units, and they are now deployed in Iraq. They are inexpensive—on the order of

$8,000 to $10,000 each. The word is out among our adversaries: “Don’t shoot at the vehicles that have that thing on them because they’ll shoot back.”

Future Icons

- Networks – Self-forming, Robust, Self-defending
- Sensors to detect and precisely identify elusive targets
- Real-time language translation to replace linguists (Defense Language Institute, III – IV)
- Air Vehicles – Fast Access, long loiter for military operations
- Space capabilities to enable goal military operations

Core Technologies

- High-productivity computing system – peta scale computer
- Prosthetics to enable return to units without loss of capability
- Quantum Information Science for new computational capabilities
- Low-cost titanium to enable routine use (3.5/lb military grade alloy)
- High Energy Liquid Laser Area Defense System as a penetration aid to replace stealth

Figure 3 DARPA Programs Supporting the Warfighter

Rapid-Reaction Support Networks

We are in a revolution today. Back in the old days, our targets were not moving. We could take our time disabling them, but our enemies quickly learned that a fixed target was a dead target against the United States. They learned how to become mobile and to fractionate themselves into small groups. We can no longer tolerate the time gap between finding the target and taking care of it. To prevail in the battles of the future, we have to be able to respond quickly. That is one of the reasons for Predator and Hellfire.

What do we have to do to defeat the enemies of the future? Everything will have to be integrated (Figure 4). Assets used to find targets will be used to destroy targets. The battles of the future will probably not be force on force. Tanks are still important, but they are going to be used differently. In the battle scene of the future, the network integrating everything becomes the weapon of the future and has to be reliable and dependable. It has to be self-forming as the forces flow in because the network now is as important as the platforms, maybe even more so.

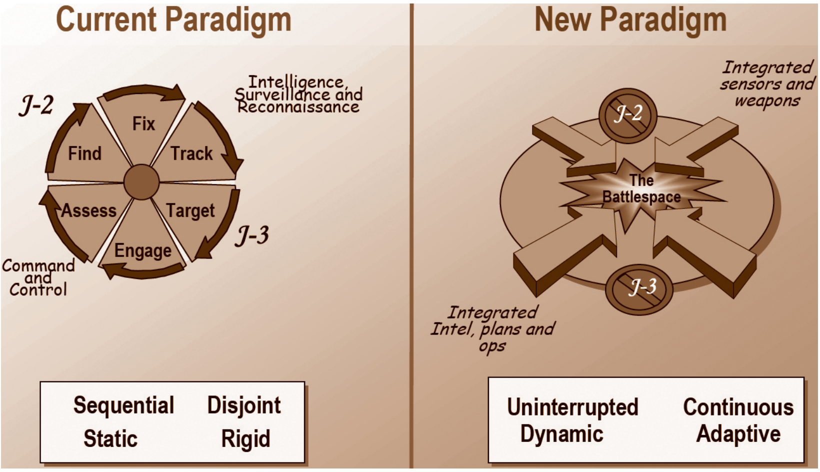


Figure 4 Network-Enabled Shift

Network-Centric Structure

At DARPA, we have broken the problem down into two parts with a gap between them (Figure 5). First, there is the network-centric enterprise, the strategic level, the back echelons. These are the people with high clearances and typically great fiber bandwidth. They do all the planning.

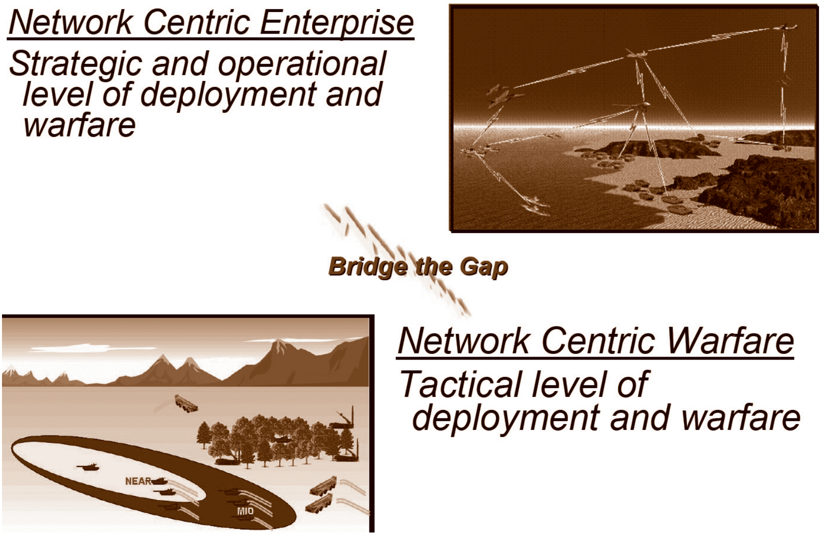

Network Centric Enterprise
Strategic and operational level of deployment and warfare
Bridge the Gap
Network Centric Warfare
Tactical level of deployment and warfare
NEAR
MIO

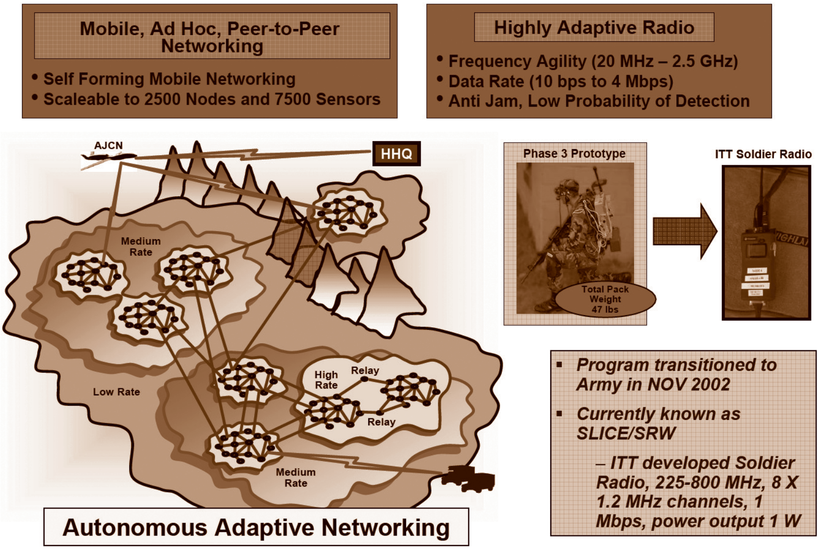
Figure 5 Military Operations Network-Centric Structure

Down at the tactical level, all connections are wireless. Here, the network cannot rely on infrastructure because the infrastructure is too easily disabled. The infrastructure has to be part of the flow into the system. The people at this level do not have clearances; some are coalition partners. It is a nasty environment, with a lower bandwidth. These people have to be connected so that they can exchange information that is not readily available, know what is going on, and resupply any lax areas. That is part of how to bridge the gap between these two organizations.

As nodes come and go at the tactical level, the network has to recognize and accommodate it—take the node out, put the node back in, etc. And it all has to happen automatically. That is a tall order; but several years ago, DARPA proved it could be done. We built prototype radios and showed that dismounted warfighters could not only be connected, they could know where one another was. The Army took the prototype over and developed it into the compact Soldier Radio Waveform.

Networking for Situational Awareness

We went even further. We created a program to interconnect all the platforms (Figure 6). If a platform went out of line of sight, we developed techniques for holding the information going to it until it was back on the net.



Mobile, Ad Hoc, Peer-to-Peer Networking

- Self Forming Mobile Networking
- Scaleable to 2500 Nodes and 7500 Sensors

Highly Adaptive Radio

- Frequency Agility (20 MHz – 2.5 GHz)
- Data Rate (10 bps to 4 Mbps)
- Anti Jam, Low Probability of Detection

Autonomous Adaptive Networking

- *Program transitioned to Army in NOV 2002*
- *Currently known as SLICE/SRW*
    - *– ITT developed Soldier Radio, 225-800 MHz, 8 X 1.2 MHz channels, 1 Mbps, power output 1 W*

Figure 6 Small-Unit Operations Situational Awareness System

Everyone wanted that common radio. But it was very expensive, and we had a lot of legacy radios. Further, we did not really know how people were going to use a common radio because we had not been able to give them a network-centric capability.

We asked ourselves if we could network those legacy radios to the point of true network-centric warfare, which is what we needed to be able to respond to the current and future enemy.

Self-Forming Networks

The result was the Future Combat Systems-Communications (FCS-C) gateway architecture, which could seamlessly connect each of the radio systems, whether on a vehicle, airborne, or carried by an individual Soldier (Figure 7). If people in the First

Battalion using the PRC-119 wanted to talk to a Company, the gateway would automatically change the protocol. A similar gateway is what allows a user with a Global System for Mobile Communications (GSM) cell phone to talk to someone with a Code Division Multiple Access (CDMA) cell phone. The difference is that the FCS-C does not need towers or infrastructure.

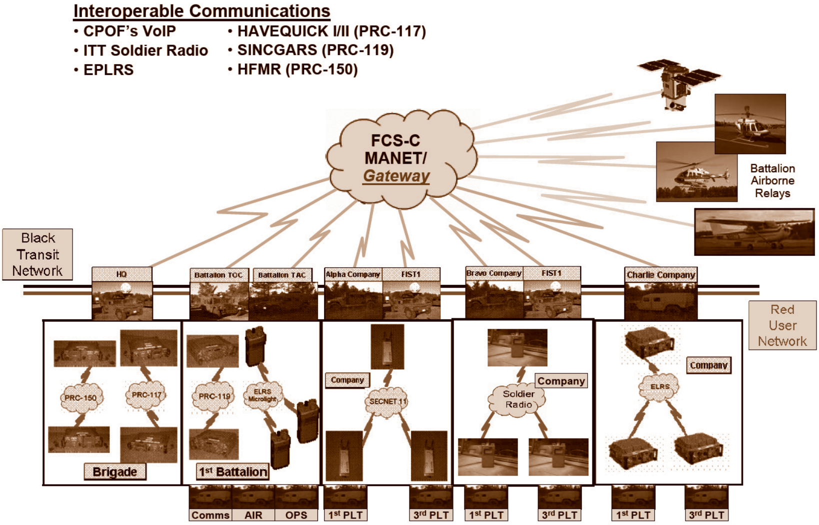
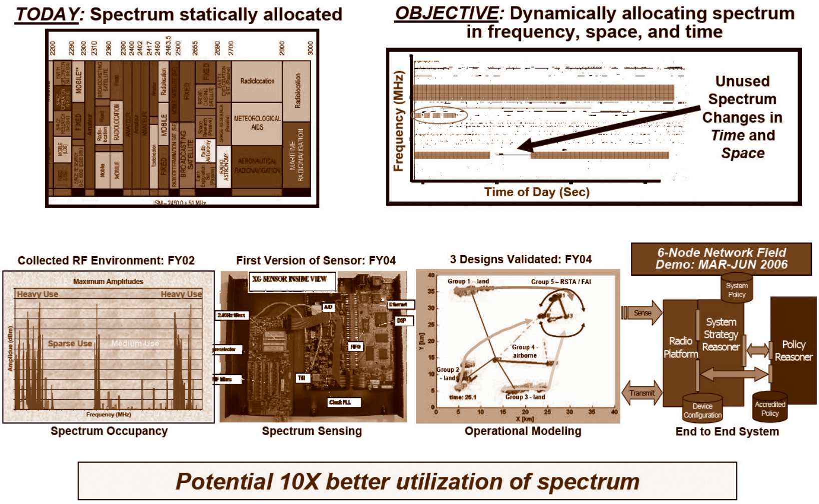


Figure 7 FCS-C Network Centricity Demonstration

We overcame the problem of finding the local radio spectrum by having the radios themselves find the spectrum and create the network based on the spectrum at the time. Even though the spectrum was 100% allocated, we found that only 5% to 10% was actually being used at any instant in time. The result was the neXt Generation (XG) communications technology, which was demonstrated last summer (Figure 8). When the radios come in to form the network, they listen to the spectrum, find the part that is not being used, and go to that part. Everybody on the network tunes to that part. If there is interference, the network recognizes it and goes to another part of the spectrum. We also showed that the network can stay ahead of a jamming system that constantly goes to the part of the spectrum in use.



***TODAY*: Spectrum statically allocated**

***OBJECTIVE*: Dynamically allocating spectrum in frequency, space, and time**

Collected RF Environment: FY02 | First Version of Sensor: FY04 | 3 Designs Validated: FY04 | 6-Node Network Field Demo: MAR-JUN 2006

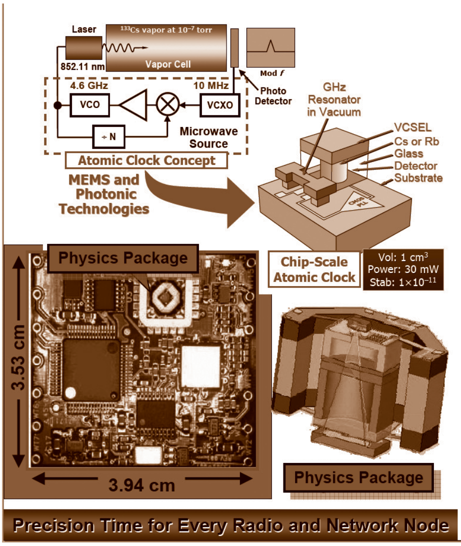
Spectrum Occupancy | Spectrum Sensing | Operational Modeling | End to End System

Potential 10X better utilization of spectrum

Figure 8 neXt Generation (XG) Communications

Chip-Scale Atomic Clock

The problem is that we need the spectrum to network the weapon, and the enemy knows it. It is going to try to take the network down with the same kinds of commercial networks it is using now for situational awareness, calling down fire, etc. One of the easy ways to disable a self-forming network is to jam its GPS [Global Positioning System] so that it cannot get a time signal. One of our program managers proposed putting a low-power chip-scale atomic clock in every radio that would provide precise time for several days (Figure 9). Our goal now is to reduce the size of that chip package to 1 cubic centimeter. We are well on our way to enabling a soldier to continue to talk with a Single-Channel Ground and Airborne Radio System (SINCGARS) for several days without a GPS.



•Goal:

•Integrate MEMS, photonic, and electronics technologies to achieve miniature, low-power atomic timing and frequency references with

•Allan deviation < 10-11 over 1 hour (1ms/day)

•Size <1 cc

•Power Consumption < 30 mW

•Key Accomplishments:

•Chip-scale atomic physics package demonstrated with ~5 mW of power consumption

•GHz vibrating micromechanical resonators demonstrated

•Chip-scale atomic clock with 5x10-11 Allan deviation at 1 sec, in a 10cc package, consuming 180 mW

Figure 9 Chip-Scale Atomic Clock

ORCLE

Another system we are developing is the Optical and Radio Frequency Combined Link Experiment (ORCLE) (Figure 10). ORCLE combines a high-data-rate laser and a colocated radio frequency (RF) link. The idea here is that, no matter where you are around the world, sooner or later, you will find a fiberhead. If one airplane is connected to a fiberhead and the rest to ground units, you can communicate around the world over that fiber. When the Transformation Communications Satellite (TSAT) is deployed, ORCLE is designed to connect to that fiber for a virtual fiber linkup in the sky. The RF link helps the lasers link up and self-form the network and also ensures conductivity if clouds are obscuring the laser beams. The result will be a system that always allows low-bandwidth, high-priority messages to get through.

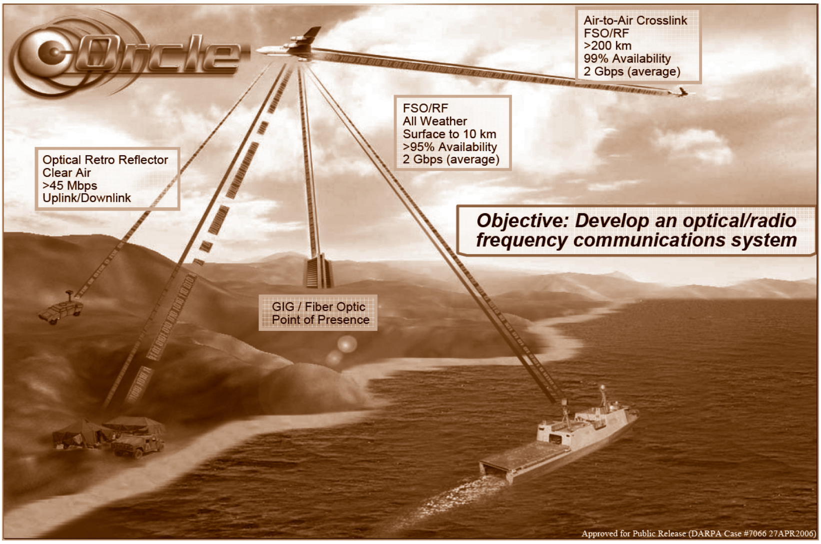
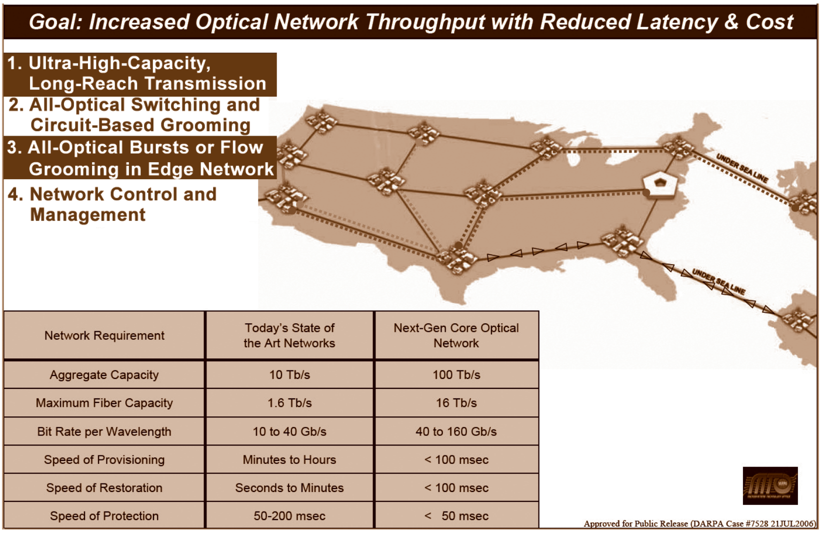


Figure 10 Optical and RF Combined Link Experiment (ORCLE)

OPTICAL MEMORY

DARPA is also building the next-generation core optical network, an all-optical Internet that will self-form and immediately repair itself if the fiber breaks (Figure 11), The network will allow people in the military anywhere to transfer large quantities of data and imagery through the ORCLE network. One problem we had to overcome was how to store optical communications in an all-optical router if they could not be sent immediately. So, we developed optical memories. We can slow light down enough so that it can remain where it is locally while the router figures the next route.



Goal: Increased Optical Network Throughput with Reduced Latency & Cost

1. Ultra-High-Capacity, Long-Reach Transmission
2. All-Optical Switching and Circuit-Based Grooming
3. All-Optical Bursts or Flow Grooming in Edge Network
4. Network Control and Management

Network Requirement	Today's State of the Art Networks	Next-Gen Core Optical Network
Aggregate Capacity	10 Tb/s	100 Tb/s
Maximum Fiber Capacity	1.6 Tb/s	16 Tb/s
Bit Rate per Wavelength	10 to 40 Gb/s	40 to 160 Gb/s
Speed of Provisioning	Minutes to Hours	< 100 msec
Speed of Restoration	Seconds to Minutes	< 100 msec
Speed of Protection	50-200 msec	< 50 msec

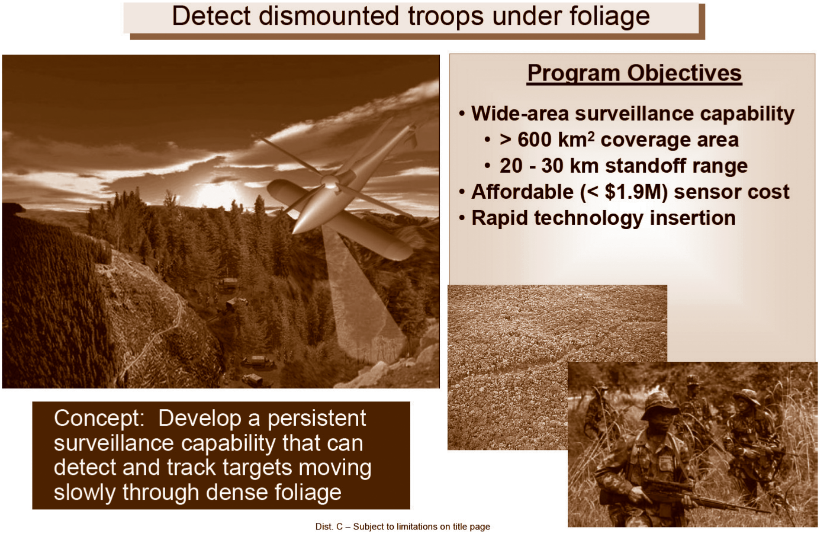
Approved for Public Release (DARPA Case #7528 21JUL2006)

Figure 11 Next-Generation Core Optical Networks

That technology is what we are going to need to adapt to unrestricted warfare. We need one person with situational awareness to be able to communicate that situational awareness to anyone and call for fire without needing the tank along side.

TARGET DETECTION AND IDENTIFICATION

We are also working on target detection and identification. The objective of one program, called Foliage Penetration Reconnaissance, Surveillance, Tracking, and Engagement Radar (FORESTER), is to find people under foliage (Figure 12). Very High Frequency/Ultra High Frequency (VHF/UHF) radars can find vehicles; but we want to find dismounted troops out of their vehicles, which is very difficult in a forested area. FORESTER, mounted on an A160 autonomous Predator-class helicopter, can detect people walking among trees. The aircraft has a range of a couple of thousand miles and can stay up for a day. To identify a possible target, we are developing a synthetic-aperture laser radar or ladar that will let us take a photograph of that target from an airplane and unleash a weapon on it (Figure 13).



Detect dismounted troops under foliage

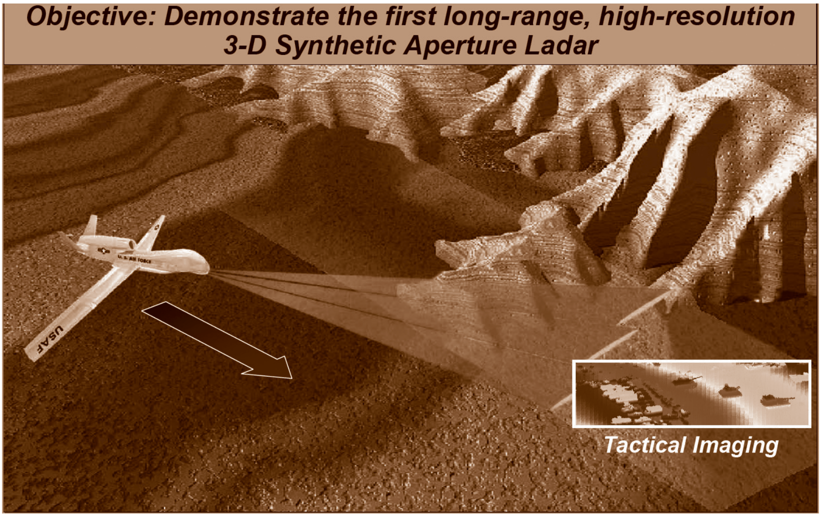
Program Objectives

- Wide-area surveillance capability
  - > 600 km^2 coverage area
  - 20 - 30 km standoff range
- Affordable (< $1.9M) sensor cost
- Rapid technology insertion

Concept: Develop a persistent surveillance capability that can detect and track targets moving slowly through dense foliage

Dist. C – Subject to limitations on title page

Figure 12 FORESTER



Objective: Demonstrate the first long-range, high-resolution 3-D Synthetic Aperture Ladar

Tactical Imaging

Figure 13 Synthetic-Aperture Ladar for Tactical Imaging (SALTI)

LANGUAGE TRANSLATION

Unrestricted warfare means that we may be fighting battles all over the world. That means we will need to know what is going on all over the world—we will need to talk to people; we will need to understand what the radio, TV, and the newspapers are saying. We are developing technology that translates foreign language broadcasts with a 5-minute delay. We are actually using it in Iraq today instead of linguists for translating TV stations like Al Jazeera. It is not perfect, but it is good enough to give someone the gist of a story so that they can decide if they want to have the rest translated (Figure 14). Our intent is to develop this capability to the point where the warfighter no longer needs a linguist to translate. We are aiming for 90% accuracy, which is roughly equivalent to a Defense Language Institute (DLI) level four linguist. We believe that we will be able to go directly from speech to a translated text by 2009 or 2010.

- **Program Goal**
  - **Fully automated and highly accurate language translation**
  - **Current foreign language focus:**
    - **Arabic**
    - **Chinese**

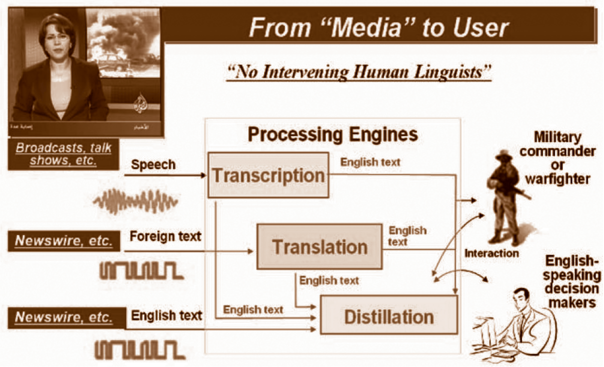


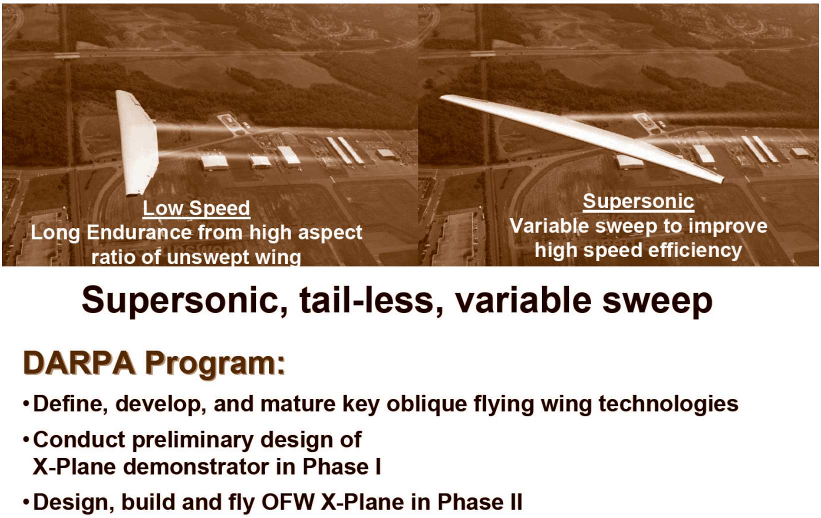
Figure 14 Language Translation

AIR VEHICLES

We are working on a lot of ideas for air vehicles. The Wasp has revolutionized the situational awareness process for the Marines in Fallujah and Ramadi. It looks like a bird so the enemy usually ignores it.

Oblique Flying Wing

Another program is developing the OFW (Oblique Flying Wing) (Figure 15). Like an airplane, it takes off normally with the wings perpendicular to the direction of flight. It cannot go very fast in that configuration but is very efficient. When it needs to go fast, it can turn the wings—as if the engine were on a lazy susan—and go supersonic. If it penetrates any defenses, it can turn itself back into the efficient configuration and loiter for a long time.



Low Speed
Long Endurance from high aspect ratio of unswept wing

Supersonic
Variable sweep to improve high speed efficiency

Supersonic, tail-less, variable sweep

DARPA Program:

- Define, develop, and mature key oblique flying wing technologies
- Conduct preliminary design of X-Plane demonstrator in Phase I
- Design, build and fly OFW X-Plane in Phase II

Figure 15 Oblique Flying Wing

Autonomous Refueling

We have developed an F-18 Unmanned Aerial Vehicle (UAV) surrogate that refuels autonomously. It will attach itself to a tanker hands off. This capability is a total paradigm shift because the UAV does not wear itself out from landings and takeoffs. Because the limiting factor on endurance is oil, we will have to learn to pass oil as well as fuel. Autonomous refueling will change the way we operate—we will be able to deploy Global Hawk-like aircraft that will stay up for months and years. The tanker itself could be autonomous—an autonomous tanker could fuel an autonomous aircraft. Our whole fleet could stand constant watch over an area, each of them with a Hellfire or two ready to go.

Orbital Express

We are also working on space programs. Last week, we launched the Orbital Express, which is an on-orbit servicing system with autonomous refueling capabilities in space (Figure 16). A satellite will hook up with it, mate to it, and receive fluids from it. It will also be able to reach out an arm and change out electronics. It is now going through checkout.

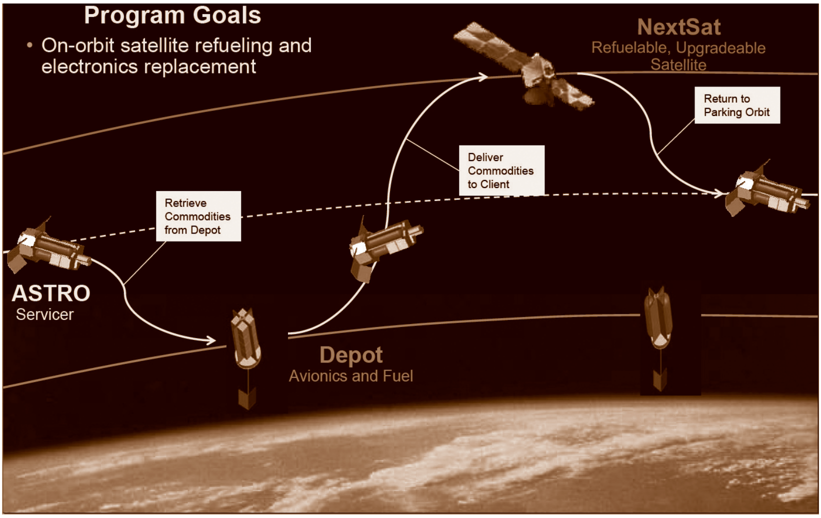
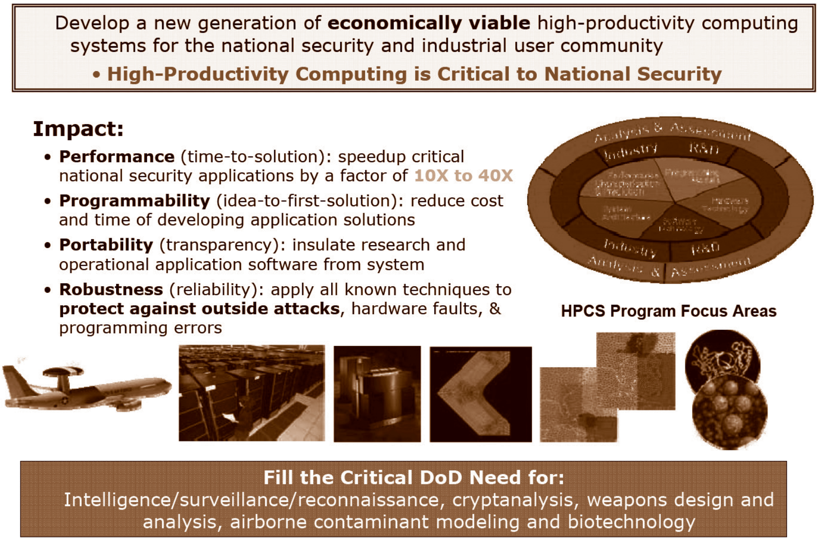

Program Goals
• On-orbit satellite refueling and electronics replacement
NextSat
Refuelable, Upgradeable Satellite
Return to Parking Orbit
Deliver Commodities to Client
Retrieve Commodities from Depot
ASTRO
Servicer
Depot
Avionics and Fuel

Figure 16 Orbital Express: On-Orbit Servicing System

HIGH-PRODUCTIVITY COMPUTER

Unrestricted warfare means we are going to have to respond quickly to threats. We have to do a lot of building and testing today because our computers are not fast enough to be able to do it virtually. We are on the verge of building a high-productivity pedaflop computer that performs 1015 instructions per second (Figure 17) or 1 billion MIPS. This is a high-productivity system, not a high-performance system. The reason is that we placed two constraints on the contractor: the machine had to operate in the pedaflop range, and it had to be easily programmable. To meet the terms of the contract, the contractor has to prove that the machine operates as a pedaflop and can be programmed 25 to 100 times faster than a MIPS machine. It will be operational by 2010 and will give us a big advantage in terms of unrestricted warfare.



Develop a new generation of **economically viable** high-productivity computing systems for the national security and industrial user community

- **High-Productivity Computing is Critical to National Security**

Impact:

- **Performance** (time-to-solution): speedup critical national security applications by a factor of **10X to 40X**
- **Programmability** (idea-to-first-solution): reduce cost and time of developing application solutions
- **Portability** (transparency): insulate research and operational application software from system
- **Robustness** (reliability): apply all known techniques to **protect against outside attacks**, hardware faults, & programming errors

HPCS Program Focus Areas

Fill the Critical DoD Need for:
Intelligence/surveillance/reconnaissance, cryptanalysis, weapons design and analysis, airborne contaminant modeling and biotechnology

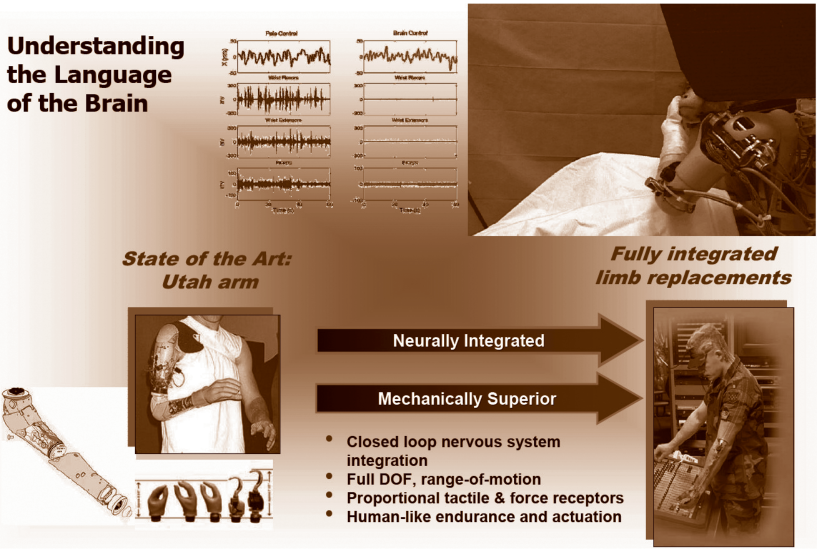
Figure 17 High-Productivity Computing System

PROSTHETICS

We have an exciting program in prosthetics (Figure 18). It started with a monkey at Duke University. We put microelectronic implants into her brain, taught her to bring two balls together with a joystick to get a treat, and then used the signals from her brain to manipulate a mechanical arm. The signals from her brain went to the Internet and then to MIT where the arm was located. When she moved her arm to operate the joystick, the mechanical arm at MIT would move just like it. Then, we took the joystick away. She knew she had to bring those two balls together to get the treat.

She moved her arm as if she were still operating the joystick, and the arm at MIT also moved. We thought we had captured the motor signal, but we had actually tapped into her thought. After a while, she learned that she did not have to move her arm to move the balls. She just had to think it, and her brain pulled the balls together.

Then we did something fantastic. We connected an artificial arm to her brain with wires. When she was offered a piece of food, she used thought to make the arm reach out, take the food with its fingers, and bring it to her mouth. We think we can build an artificial arm with all the degrees of freedom and articulation of a real arm. The arm itself is an engineering marvel, but the revolutionary part is that it will be controlled by the wearer's brain. We will run fiber optics through the nerve in the feedback path that brings the impulses back to the brain so the brain knows where that arm is. And this is all happening here at Johns Hopkins. Dean Kamen is also working on an arm, but Johns Hopkins is giving it neural control. We have cases now where people have actually regained feeling. Imagine what else can be done with this capability.


Understanding the Language of the Brain

State of the Art: Utah arm

Fully integrated limb replacements

Neurally Integrated

Mechanically Superior

- Closed loop nervous system integration
- Full DOF, range-of-motion
- Proportional tactile & force receptors
- Human-like endurance and actuation

Figure 18 Revolutionizing Prosthetics

CONCLUSIONS

DARPA is always interested in innovative ideas and people with good ideas. Get to know our program managers—they are the ones who really run the place.

1.5 PRIVATE SECTOR VIEWPOINT—ECONOMIC INFRASTRUCTURE/SYSTEMS RESILIENCY

Alfred Berkeley

The National Infrastructure Advisory Council (NIAC) was created by Executive Order in the wake of the September 11 terrorist attacks. The NIAC provides the President with recommendations on policy changes to improve America's critical infrastructure security. Since its inception, the Council has developed a homeland security policy that helps define how the Federal government and private sector can collaborate to protect the public good. The Council strongly promotes the view that the private sector must play an integral role in developing these policies. To date, the NIAC has completed 13 reports, all of which address the following topics:

- Clarification of roles and responsibilities between public and private sectors
- Risk assessment and management
- Information sharing
- Protective strategies

INTRODUCTION

We've been talking today about defining, adapting to, and combating URW with analysis, strategy, and technology. I'm going

Mr. Alfred Berkeley is chairman and CEO of Pipeline Trading Systems. He has over 25 years of experience as a former president and vice chairman of the NASDAQ Stock Market, Inc. He earned an MBA from the Wharton School of Finance of the University of Pennsylvania and a BA from the University of Virginia. He has been an officer in the United States Air Force and is a trustee of The Johns Hopkins University.

to discuss the same issues but from the perspective of the business community. I specifically want to discuss the lessons that the business community has learned from 9/11 and the work that I've been doing since October of 2001 with the National Infrastructure Advisory Council. I am speaking as an individual citizen and am not representing the views of the National Infrastructure Advisory Council.

THE NATIONAL INFRASTRUCTURE ADVISORY COUNCIL

The NIAC was created to bring a business perspective to many of the issues associated with URW. I was asked to participate because the NASDAQ was the target of daily, sophisticated hacking attacks, particularly from central Europe and Asia. We had developed a very close working relationship with the FBI; the National Security Agency; the Pentagon; the White House; and the New York Stock Exchange, whose websites and operations were also being hacked.

Executive Orders 13286 and 13231 led to the establishment of the NIAC shortly after 9/11, specifically to address cyber security. The scope was subsequently expanded to include other infrastructures such as water systems, railroads, and finance. Since then, it has expanded considerably to include 17 industrial sectors. With the creation of the Department of Homeland Security (DHS), administrative support for the NIAC shifted from the National Security Council to DHS.

The Council consists of no more than 30 people who represent many diverse sectors of the economy. The NIAC makes policy recommendations to the President to improve America's critical infrastructure security. The NIAC is more than an advisory council because it addresses process and does substantive work.

Current and former members include Chairman Erle Nye from TXU and former Vice Chairman John Chambers from Cisco. Others include: Craig Barrett from Intel; Margaret Grayson, a cyber expert; Ray Kelly, the Commissioner of Police in New York; Martha Marsh, head of Stanford University's Hospital;

Tom Noonan, General Manager of IBM's Internet Security Group; Bruce Rohde, Chairman and CEO emeritus of ConAgra Foods; Dr. Linwood Rose, President of James Madison University; and John Thompson from Symantec, which produces security software for PCs. Past members have included Don Carty, CEO emeritus of American Airlines, who brought an aviation perspective; Archie Dunham, Chairman of Conoco Phillips; Chuck Holliday, CEO emeritus of Dupont; and Marty McGuinn, who ran Mellon Financial, a very large commercial banking operation. Marilyn Ware, Chairwoman of American Water Works, highlighted an important infrastructure issue: water is particularly vulnerable, we all need water, and many water systems can't detect what's in them. Another former member was Tom Weidemeyer, Chief Operating Officer of United Parcel Service, which has the most feet on the street of any business. United Parcel Service provides a particularly interesting view into the economy because it carries packages that could potentially hold dangerous items and it has people everywhere every day.

The Business Community Perspective

The NIAC has met with the President about four times in six years; each meeting lasting long enough to engage him in discussions and find out what he thought was relevant and interesting.

The business community view on URW that I've gleaned from 5 or 6 years on the Council may counterpoint some of what you've heard today and reinforce other expressed views.

So our first project was to spend about 6 or 7 months getting a firm grounding in the existing laws and understanding what information the government needed—how much, what was relevant—and how that information might be used. When we investigated, we found that business was so nervous about FOIA—the Freedom of Information Act—the Plaintiff's Bar, competitors, shareholder suits, etc., that no company wanted to come forward with any information about weaknesses in its operations.

Partially on our recommendation, Congress passed a law exempting from FOIA information provided to the federal government expressly for the purpose of infrastructure protection.

We thought we had solved that problem; but a year and a half later, only a few companies had come forward with any information. So we went back out into the field and found out that businesses were still reluctant because the law had never been tried in court and wasn't guaranteed to be bulletproof.

". . . we found that business was so nervous about FOIA—the Freedom of Information Act—the Plaintiff's Bar, competitors, shareholder suits, etc., that no company wanted to come forward with any information about weaknesses in its operations."

In the course of those discussions, we'd hear comments like, "Well, I'll tell you my problems, but it cannot go to my regulator because the only thing a regulator's going to do is come back and say, fix it." Some of these problems were so expensive to fix, they raised the question of whether we were building resilience or a fortress. There are many of these cases where it seems to make sense to report a situation—this little problem with the water supply, or this little problem with the railroad, or this little problem with a bridge—but then you find yourself saddled with an immediate requirement to spend more than your net worth to fix it—clearly, a non-starter.

We stumbled upon a lot of these tradeoffs during that very first project. We still do not have a case in the courts testing the law, and we do not have anyone coming forward with information that could be sensibly used by sensible people in the government with a sympathetic view to this balancing act. If the view toward these tradeoffs isn't sympathetic, if there is no effort to determine what amount is reasonable to spend—not to protect ourselves from every contingency but from risk-based contingencies—no information will be forthcoming. These are matters of trust, in the grey areas of the law. Figuring out the right balance between information and secrecy and what information goes where in the government and who gets to use it is not easy.

Risk-Based Assessment

Our second theme running through many of our activities was to answer the question: how much should the U.S. spend on infrastructure protection? In theory, you can never spend enough. We had an enlightening comment from one of our members about the interest in Des Moines, Iowa, in protecting its skyscraper. It's unlikely that Osama bin Laden really cares about that skyscraper in Des Moines, Iowa; and yet it's the center of the universe for the people who live there. You heard Secretary Chertoff talk about allocating federal funds on the basis of risk. Part of that assessment was the result of work the Council did. We recommended spending the money on the most likely targets and the most significant targets in terms of consequences. This is a significant shift away from allocating funds politically.

It will take a while for risk-based spending policies to take hold. Last week, there was an article in one of the Baltimore papers inviting community-based nonprofits—soup kitchens, projects for elderly, etc.—to apply for $635,000 in grant money to add bulletproof glass and chain link fencing to their facilities. That's the direct opposite of risk-based. Even with our emphasis on risk-basing, even with Secretary Chertoff's recognition of the value of risk-basing, and even with the efforts of local politicians to protect their communities, we haven't succeeded if we're spending over a half a million dollars to add bulletproof glass to community-based nonprofit facilities.

We must spend sensibly. There's a feeling in the business community that Osama wins if we start spending our growth capital on defensive protection that doesn't benefit us competitively.

Where do skyscrapers in Des Moines and soup kitchens in Baltimore rank versus the Capitol and Grand Central Station? How do we think about that? Part of the risk-based program was what we call the common vulnerability scoring system (CVSS).

When we began to solicit ideas on what was important to protect, everyone had a different idea depending on his breadth of vision, global awareness, and institutional pressures. We developed the CVSS to promote understanding of vulnerabilities and their impacts and to apply limited resources to the most critical vulnerabilities. The system is currently used by the Department of Homeland Security and is the basis for the allocation of funding requested from Congress, i.e., more emphasis on high-vulnerability port cities and less on the smaller cities in the heartland.

Cyber Security

Another NIAC project, headed by George Conrades, CEO of Akamai, developed strategies for hardening the Internet. Mr. Conrades organized a group of Internet experts to determine what can sensibly be done to protect it. The recommendations have been distributed to the software houses that are developing software that can be used at these hardening points. Akamai and Symantec are leading this effort, along with others on the NIAC who have influence with people in the industry.

You might ask: "When you design a new feature or a new function or when you move to Internet 2, why not design out the old vulnerabilities and design in the new, more robust processes?" That's a very interesting idea. There's not a lot of money involved—it's a matter of asking people to think about these issues as they design new products, and I'm told that it's working pretty well.

Private–Public Sector Coordination

Another of our projects was to recommend ways to involve the private sector in infrastructure protection projects of concern to the government. What we found is that one size does not fit all — not all industries are alike. For example, the railroad industry is highly organized at the industry level. It has a national control center run by the American Association of Railroads that is primarily safety-oriented and traffic-oriented. The railroads compete with one another; but because they're regional, they don't compete head to head the way technology companies do—

say Dell versus Gateway or Microsoft versus Oracle. Rather, they coordinate because they have many interconnecting standards like the gage of the rail, the interchange of railcars, etc.

At the other extreme is the apartment industry. A terrorist can cause extensive destruction in a metropolitan area by renting an apartment, turning on the gas, and setting a fuse to light a match after he leaves. The apartment industry is essentially owned by large REITs [real estate investment trusts] or small apartment owners.

> *"Last week, there was an article in one of the Baltimore papers inviting community-based nonprofits—soup kitchens, projects for elderly, etc.—to apply for $635,000 in grant money to add bulletproof glass and chain link fencing to their facilities."*

So, on the one hand, we have a highly coordinated rail industry and, on the other, a completely uncoordinated apartment building industry. The question is: what's the right level of public–private cooperation and information sharing at those two extremes and for all of the other industries in between? We realized that one-size-fits-all federal laws and regulations would not work. Some industries—the highly regulated businesses such as the telecommunications industry, the airline industry, the nuclear power plant industry—already have highly cooperative interchanges of information with the federal government.

We developed a model, which has been approved and adopted, that defines 17 different sectors. Our recommendations, which have largely been adopted, set an expectation at the federal level that each industry will be dealt with slightly differently, reflecting the reality of how well organized the industry is naturally. In some of those sectors, the industry people meet with government people every day. Some of the industries invite government people to sit in their control centers and be quick-reaction interfaces. Others just have periodic meetings and discussions.

This cooperative process is a major accomplishment because the original instinct was to enact laws and regulations that dictated public–private coordination one particular way. We were very pleased to be able to convince them that they had to recognize the realities of each of these different industries.

Avian Flu Pandemic Planning

The avian flu pandemic is an example of how the NIAC works. Typically, the President or his staff ask us a question; we assemble volunteers from the Council; and each person is allowed to have a technical assistant. One person is appointed chairperson. The group meets once a week for 1 hour and interviews as many witnesses as needed via conference calls until all possible issues are explored. Then, they write reports; and the entire NIAC vets them. We've had no trouble getting some of the most knowledgeable and interesting people from industry, academia, government, and Nongovernmental Organizations (NGOs) to participate because all they have to do is pick up the phone for an hour; and everything is off the record. We have a lot of good give and take. We have a scribe and, with Secretary Chertoff's support, a staff at DHS that digests all the material so we can turn out the reports quickly and efficiently.

"The NASDAQ has tremendous redundancy built in—doubly redundant electrical, doubly redundant circuits—because in 1991 or '92, a squirrel caused a short circuit that brought the NASDAQ down for 2 hours and 45 minutes."

The most recent issue was how to deal with the possibility of pandemic avian flu. Health and Human Services (HHS) and the Centers for Disease Control (CDC) had recommended to the President that our limited supply of avian flu vaccine go where it would save the most lives—children and old people. The President asked us to evaluate that recommendation. After about 6 or 8 months of interviews and research, we completely retooled the recommendation.

We asked the 16 (now 17) industry sectors from the earlier study to identify their critical workers. Even though the Public Health Service says it expects a 10–15% mortality rate from avian flu, the mortality rate worldwide has been about 55%. We didn't want to bet that modern medicine was going to reduce 55% down to 10%. So, we used war games with different sectors to determine how to keep the economy going with a large mortality rate.

"Their wives and husbands won't let them come to work. There won't be any trading. And, by the way, you just posited to us that there was going to be about a 4-month decline in economic activity, a little rebound, and then another 4-month wave of avian flu."

I had previously participated in a game run by the Federal Reserve in New York, along with one or two other financial services people and representatives from the electricity industry, the telecommunications industry, and the commuter rail industry. The electrical sector didn't foresee a problem even if 30% of its people were out sick. If they eliminated new installations, they would be able to reduce their field capacity by about 30% and make up the deficit. The telephone reps said essentially the same thing. The commuter rail people said they weren't sure their workers would come to work; but if they did, they'd sit in the front of the train away from the passengers and would probably be able to get people to work.

Then, I asked, "How many people in this room have been in a trading room and seen people sit shoulder to shoulder? Their wives and husbands won't let them come to work. There won't be any trading. And, by the way, you just posited to us that there was going to be about a 4-month decline in economic activity, a little rebound, then another 4-month wave of avian flu, and more economic decline. So, as a rational man, I am going to wait to buy later; I'm certainly not going to go into work and wait.

There are not going to be any buyers." Well, planners didn't want to hear that, but I think that's the actual human reaction.

LESSONS OF 9/11—NEED FOR RESILIENCE

We learned some lessons from 9/11. A high ranking person at NASDAQ was in the control center with me on 9/11 when the plane flew into the Pentagon. She said, "I'm going to get my child from his nursery school in Alexandria." She bolted. And she had her priorities right. I recounted that story to participants in the war game on the Financial Services Industry and pandemic and said, "That's going to happen thousands of times because people are not going to stay at work if their families are at risk."

I want to talk about a couple of lessons from 9/11 that tie all the NIAC work together. I happened to be in Washington on 9/11. When the second plane hit, I was actually on the phone with Richard Grasso [President of the New York Stock Exchange], who had called to ask me to delay the opening of the NASDAQ. He said "There's some problem up at the World Trade Center and a lot of my people aren't here yet." Then we saw the plane hit. We agreed to talk to each other every hour to see what we could do to help each other.

"That's going to happen thousands of times because people are not going to stay at work if their families are at risk."

As many of you know, the NASDAQ is a highly distributed network. The data centers are in Trumble, Connecticut, and Rockville, Maryland. The NASDAQ has tremendous redundancy built in—doubly redundant electrical, doubly redundant circuits—because in 1991 or '92, a squirrel caused a short circuit that brought the NASDAQ down for 2 hours and 45 minutes. The redundancy was tested on 9/11. We lost a couple of points of presence on Wall Street, specifically at Goldman Sachs and in the Merrill Lynch building, but otherwise, the NASDAQ was functioning.

The phone calls with Grasso expanded with each hour as more and more people conferenced in. At the 1 o'clock call, we had the heads of all the markets, the White House, FEMA [Federal Emergency Management Agency], and the Treasury on. The Treasury is the federal agency that actually controls policy for the markets. The question was asked, "New York, when are you going to open your backup center?" It turned out that the New York Stock Exchange (NYSE) had been joking about having a backup center; they had no backup center.

We decided that we would do whatever was necessary to get the NYSE up as fast as possible. Telephone people from all over the country flew in and laid cables down the middle of the street to get the New York Stock Exchange back up by Monday.

The point is that the industry had not prepared to be resilient. The real heroine of 9/11 is a woman named Jill Considine. Until a week or so ago, Jill Considine was President and CEO of the Depository Trust Company. The Depository Trust Company is a nonprofit jointly owned by all the banks and brokerages that handle, manage, and physically hold all the stock certificates in the United States. Jill locked her people in the building and had the National Guard bring in food and water. They processed that day's settlements, which had been traded 3 days before; they processed the next day's settlements, which had been traded 2 days before; and they processed the third day's settlements. They had a couple of days off when there were no trades; and then, they resumed business.

"The NIAC heard one recommendation to install chain link fencing on both sides of all railroad tracks—even across Kansas!"

The Federal Reserve Board also kept the country going financially immediately after 9/11. The New York Fed couldn't clear checks because checks were moved around by planes, which were no longer flying. If checks couldn't be validated, bad checks would be treated as good. We knew statistically how many checks would be invalid, but the Fed ignored it and kept the system working.

Between Jill Considine, the Depository Trust, and the Fed, our financial markets kept functioning as we struggled to get the NYSE back up in operation. I'm telling you this to demonstrate the importance of resilience—getting back in action rather than worrying about not being put out of action. Being put out of action may be a huge political problem, but it's not necessarily a big economic problem. Getting back in business is the key.

What happened in New York had economic impacts because the market crashed. But the British experience with the Irish Republican Army (IRA) over the years has shown that the financial markets respond less to each attack—the markets become more resilient. There has to be a balance between investing to protect institutions ahead of time and being able to be extremely resilient after the fact. For example, we can't afford to build a fortress around every mile of railroad. The NIAC heard one recommendation to install chain link fencing on both sides of all railroad tracks—even across Kansas! I'd much rather send a fast-reaction team to fix the blown track than spend money that should be used for growth to defend 100,000 or 200,000 miles of track. The beauty of resilience is that it will help you deal with all sorts of disasters from natural to terrorist-related. The business view on the NIAC is to always consider investments in resilience in planning for the infinite number of possible threats.

Q: *Your talk was fascinating. Recently, I attended a seminar in Alexandria, where Dr. Tara O'Toole, the Executive Director of the Center for Biosecurity [University of Pittsburgh Medical Center], talked pretty eloquently and rather forcefully over the fact that you spend a lot of money preparing to prevent bioterrorist acts, but our [health care system] is broken.*

And if we have an attack here, here's the analogy I thought of: we're putting up fencing for biodefense but we're not prepared to have a rapid-response team. Could you talk about that aspect?

Mr. Alfred Berkeley – We have not looked at that explicitly, but I certainly agree with you. If you look at it from my point of view and that of the financial services industry, in industry after industry, we've wound our businesses up so tight to the margin—cut out hospital rooms, centralized x-ray machines, outsourced recordkeeping to India—we're not providing cushions, shock absorbers. In health care, it's a matter of government policy. In most businesses, it's a matter of international competition to lower the cost of labor. We've got this enormous global wage deflation going on, where very bright, very attractive, very well-educated people in other parts of the world are willing to do the same work for a fifth or a third or less of the wages we pay. You're exactly right: we've applied our super-shrewd, short term, MBA mentality to take all the fat out of the system. With the fat goes margins of safety.

The problem is exacerbated by the financial services industry, where there's an enormous focus on leverage of short-term returns. It will throw out a CEO out who builds extra hospital beds if it's a for-profit hospital or adds an extra anything. Because moving from investment to investment is essentially friction-free in the United States, predatory investors milk existing businesses and move on if they fail. For an investor to move from one investment to another, it costs a cent a share: It could be a $100 stock; it could be a $500 stock; it could be a $5,000 stock. It's a cent for any of them… it's friction-free. The punishing unintended consequence for our country is that CEOs who are living quarter to quarter can't afford to build the extra hospital beds or the extra generators or extra whatever. I don't know how to solve that problem other than through the tax code, and that's not going to happen. I don't know if that answers your question or not, but you hit a hot button for me.

Q: *Do you think there should be more coordination between business and the intelligence agencies?*

Mr. Alfred Berkeley – Well, it's an interesting question. One of the projects that I worked on for the NIAC was to interview the CEOs of a number of very large companies about whether and under what circumstances they would work a little more closely with the Central Intelligence Agency and National Security

Agency. I had long conversations with quite a number of people from different sectors, all of whom you would recognize.

Two kinds of responses came from the very large multinationals—be they drug companies, technology companies, or financial services companies. Some said, "I've been dealing with these kinds of threats all over the world. The U.S. government people are focused on it now, since 9/11. They're hard working, they're smart, and they're doing a good job, but they just discovered the world. I've been dealing with bombings; I've been dealing with crooks; I've been dealing with industrial espionage all over the world for my entire career. I don't think that Osama bin Laden is that big a deal to my company. I don't operate in Afghanistan; I haven't been able to operate in Iraq for the last 40 years; but before that, we did." Global CEOs treat terrorism as just another problem. That conversation often led to the resilience discussion: "Don't order me to protect every door and every plant I'm in or I'll just put my plant somewhere else because I can't bear those costs, selling in a global market."

"But I want all those people to have something to lose; if they've got something to lose, they are not going to join Osama, and they're not going to want to come over here and fight. Democracies don't fight with each other, basically."

The other really interesting comment was: "You want me to cooperate more with the CIA and the NSA, but what do I tell the 91 other countries' intelligence services when they knock on my door?" There's this divergence in the interests of the home nation and the interests of a global company. The global company is a little less national than you think. It has a different set of objectives, which is a complicating overlay to issues where we say: "I want to talk to you about working a little closer with the intelligence community in the United States." They're saying, "I've got 91 other intelligence agencies to deal with, too. If you've got an incident or an issue, I'm pleased to be as helpful as I can, but it has to be legal, the regulating part of the federal government can't have anything to do with it—can't know anything about it, and, by the way, stop sending people from 15 different federal agencies to talk to me about the same issue. And, by the way again, when you send somebody in, please let them know something about my business." These are just the realities of dealing with these companies.

I don't have any easy answer for you. I think the right answer is diversification, and I think it's helping these other countries get rule of law. Probably the right answer is to get at the root cause of the terrorism, probably through those economic arguments we heard today.

"We have to fix the underlying causes of terrorism, which, in my opinion, are people not having enough to feel secure about themselves, their families, and their future. The way to do that is to help with economic reform and ownership."

I can tell you that a lot of the business community people that I deal with say it's perfectly okay to capture and kill a bunch of thugs, but don't aggrandize them so that they're presented as more than thugs—i.e., martyrs. They exist because people are genuinely unhappy, so let's figure out what that unhappiness is.

I think the best thing that could possibly have happened to this country was to have two or three billion people move from command economies to free markets in Russia and China, but we're going through a 50- or 100-year adjustment phase that's going to be really painful for us. But I want all those people to have something to lose; if they've got something to lose, they are not going to join Osama, and they're not going to want to come over here and fight.

The most brilliant legislation we've ever had in this country is something you and I never think about anymore. It's the legislation that allowed us to have a civil society in the face of massive influxes of people who had nothing. It was the Homestead Act. It reflected a brilliant public policy in the 1850s, '60s, '70s and, '80s when there were 13 different waves of European immigration, all triggered by different causes, like the potato famine or a war in some country. You can see these 13 different ethnic communities in every Atlantic port city. It's because my forefathers and probably yours came looking for opportunity and arrived with almost nothing. The idea behind the brilliant Homestead Act was to give them something to lose. Let them work a plot of land, a sufficient amount of land to support their family for 5 years, and then they own it.

Sounds a lot like a stock option, doesn't it? Stock options are the modern equivalent of the Homestead Act. Wages and tax laws are basically stacked against most American workers. They will never have enough money to live on in the additional years that medical progress has given after they leave the workforce. They have to have savings. The right way to have savings is in the productive assets of the economy—i.e., equities. That's exactly what we want other countries to do: give ownership of the productive assets of their economies to their people. In Islamic law, there are two fundamental biases against that system: no-interest savings (which they work around) and the way property is divided when someone dies. It gets smaller and smaller and smaller and smaller. It's suboptimal for earning a living. France had the same problem until World War II. We have to fix the underlying causes of terrorism, which, in my opinion, are people not having enough to feel secure about themselves, their families, and their future. The way to do that is to help with economic reform and ownership.

A great man named Hernando de Soto—a descendant, I gather, of the explorer Hernando de Soto—has written a book about what economies need to get started. He says that you need really good ownership law so that you're sure of what you own. In India, there's a gentleman at the World Bank, Srivatsa Krishna, who was the "mayor" of Hyderabad when he was in the Indian Administrative Service. He did for the Hyderabad what Thomas Jefferson did for this country in 1815: order land surveys and establish firm ownership and land registries. It meant pushing a lot of squatters off the land and making sure that productive enterprises could actually own the land under their plant. With clear titles established, Hyderabad boomed.

So, some people in India are getting a shot at a real title to land, which allows them to use it as collateral for a loan. They have a recognized bankruptcy law, a recognized uniform commercial code, and contract law, so they're beginning to have the kinds of certainties that we take for granted here but are the basis for families being able to own their own resources.

Q: *How long do you think the war in Iraq will last?*

Mr. Alfred Berkeley – This is a marathon, not a sprint. It's probably a multi-generational marathon. You can look at it from the thuggery side. Hitler started in a small town in Germany with two thug associates, and the whole Gestapo grew out of two guys who figured out how to harass and frighten and then kill and frighten people.

I had a conversation with Charlie Allen at DHS about this. What expectation should we have for the length of this conflict? He stressed to me the need for the American public to understand that this is a marathon, not a sprint.

I do think you can deal with the thuggery side of it by capture and kill; but I don't think that's sufficient. I think you have to address the fact that half the population of Iraq is under 20, and they have nothing. On television, they see us wasting more than they'll ever have in their entire lives. I'm not talking about issues of globalization and north/south divide and that sort of stuff. I'm just saying we need to promote the same kind of economic opportunity in these countries with these huge population increases that we promoted successfully in Germany and Japan and many other places in the world. Until we fix those root causes—which may take 50 to 100 years—we'll have a problem.

It really amounts to giving the other guy an opportunity to be in a win–win relationship with us rather than forcing him into a win–lose relationship. So it's not an easy answer. We could do a lot by speaking out about the long-term nature of the problem and its economic roots as opposed to short-term victories and defeats reported in the media.

Q: *Exploring a little more the tradeoff between prevention and resiliency, resiliency doesn't help much if the problem is large numbers of people being killed in an attack. You can't bring them back to life. Even if it doesn't show in the GNP, a lot of people dead is a lot of people dead. Based on the work you've been doing in trying to prioritize threats, do you think that proper attention is being given to prevention of the kinds of threats where large numbers of lives might be vulnerable to a single attack?*

Mr. Alfred Berkeley – Well, that would be a chemical or biological/radiological attack.

Q: *Or a bad underground fire in a big city.*

Mr. Alfred Berkeley – I think we spend a lot of time on the highly visible, and much less time on the harder to visualize. I think that's human nature. For example, I think that we need to ask people in construction to give an alarm when gas valves are putting out a lot more gas than they should. It's a complex issue. I think we could do a lot more by working with the people who are building and maintaining infrastructure rather than issuing an order for everybody to change their gas meters. I don't think that'll happen—I don't think it's realistic. But I also think that if we just began doing this, we'd get an awful lot of infrastructure fixed. The gas meter is an interesting specific example.

Q: *I'm going to ask one that gets you to extrapolate from your marketing discussion. I was intrigued some years ago by the Chicago Board of Trade trading in catastrophe derivatives. So is there a future for catastrophe insurance in the following case? All the contingencies that you so eloquently explained all involve stable rational expectations. There is a market in expectations that it continues to function. But let me ask you to address the question of catastrophe or something similar where that assumption doesn't hold—where you have a declaration of national emergency, marshal law is in effect, and there are no business owners because the government owns the businesses. Now what?*

Mr. Alfred Berkeley – We actually have begun looking at this issue in a slightly different way. Remember I said the Depository Trust Company kept going and the Fed honored your checks right after 9/11? Something else happened in Dubai at the same time: Lloyds of London cancelled all its insurance on ships. One of these Sheiks in Dubai said he would underwrite those potential losses personally.

John Chambers, who is at Cisco, and I met with the Deputy Secretary for Homeland Security and asked DHS to begin to compile a list of all the kinds of things like insurance that we might want some enabling legislation in place for, laws that would become effective when an emergency is declared. The Fed made a wonderful interpretation and the right one, but they probably should have had a little clearer authority to do it. There are many other areas in the economy that require a little bit of forethought.

Catastrophe insurance is sold every day—it's called reinsurance. But, there are unintended consequences. The Louisiana Attorney General is saying: the insurance companies should pay for flood damage even though it was specifically excluded from homeowners' policies. Some insurance companies are not allowed to write insurance in New Orleans because they refuse to pay money out for losses they never underwrote to begin with. So, the law is always in a state of flux there.

I think that the ultimate answer is to get as many individual Americans to think about what they would do in a natural disaster and prepare for it, and then they would be prepared for an unnatural disaster. Prevention, resilience, and insurance all knit together to create preparedness.

1.6 INTELLIGENCE COMMUNITY PERSPECTIVE ON THE MATURING URW THREAT

Mathew J. Burrows

INTRODUCTION

I would like to discuss with you today my perspective on the changing character of warfare, including foreign development of so-called "unrestricted warfare" strategies, and the issues this raises for how analysts assess emerging threats to U.S. military operations and security interests.

In the face of U.S. superiority in conventional, high-technology warfare, potential adversaries are developing strategies designed to counter or circumvent vital U.S. operational capabilities and to undermine strategic political and public support for military action. Interest in unrestricted warfare strategies reflects this trend as both potential state and non-state adversaries seek new opportunities and new domains in which to exploit perceived U.S. political and military vulnerabilities.

Foreign unrestricted warfare concepts advocate attacking an enemy's finances, resources, and networks and the use of media and psychological warfare and terrorism—rather than seeking to defeat military forces on the battlefield—as the means to achieve political objectives and undercut an enemy's national resolve. If such concepts are employed in the future, we should expect a shift

Dr. Mathew J. Burrows is the Director, Analysis and Production Staff, National Intelligence Council. He is a member of the Directorate of Intelligence (DI) Senior Analyst Service, and has served the CIA in Western Europe, including the development of institutions such as the European Union. Formerly, he was the Intelligence Community Fellow at the Council on Foreign Relations, and special assistant to the U.S. UN Ambassador, Richard Holbrooke. Dr. Burrows served as Deputy National Security Advisor to Treasury Secretary Paul O'Neill.

in the focus of an adversary's attacks—away from confronting the U.S. military directly through force-on-force engagements and towards targeting key elements supporting the U.S. way of war at both the operational and strategic levels. In the future, such attacks could target capabilities perceived to be critical to U.S. military operations such as communications networks, intelligence and surveillance systems, and logistics. In addition, adversaries might seek to undermine U.S. and allied national will by imposing untenable costs, manipulating public opinion, upsetting vital political alliances, and targeting critical U.S. infrastructures.

THE ADVERSARIES' APPROACH TO WARFARE

We should not think of unrestricted warfare as only the tactic of terrorists and insurgent groups. The term unrestricted warfare was recently coined by two Chinese Colonels, Qiao Liang and Wang Xiangsui, to describe how both state militaries and non-state groups could strike out against an enemy with a superior military force in times of conflict. How adversaries will implement such strategies in the future, however, will depend upon their strategic objectives and technical capabilities. In general, I would expect the following:

- *Military powers* with advanced technical capabilities will likely seek to deter U.S. military intervention by acquiring counters to specific military capabilities perceived as critical to U.S. military operations.
- Conversely, *terrorist groups, insurgents, militias, and less advanced militaries* will likely focus on irregular warfare operations, terrorism, and information campaigns to undercut U.S. political and public support for ongoing military operations.
- *Rising military powers* will likely straddle both approaches, seeking some advanced military capabilities—such as air defenses and antiship weapons—while also developing capabilities to impose costs and undermine U.S. resolve through irregular warfare, terrorism, and attacks against U.S. allies and key infrastructures.

What does this shift in how our adversaries approach warfare and the potential employment of unrestricted warfare strategies mean for the character of future conflicts and the types of threats we will face? The implementation of such strategies, especially if they are enhanced by the emergence of new technologies, will likely present new challenges to U.S. policymakers and defense planners. Let me mention a few that I can foresee:

Containing the escalation and expansion of future crises will likely become more problematic in the future. The inability to compete directly with U.S. conventional forces will continue to drive some adversaries to attempt to expand and escalate conflicts beyond the traditional battlefield. Some adversaries, for example, might target the U.S. mainland and territories and those of its key allies in an attempt to distract U.S. strategic attention, compel the redeployment of military forces to the homeland, and undercut resolve for continuing military operations. In addition, both state and non-state adversaries might view the intentional escalation of a conflict—by imposing or threatening to impose significant costs in response to U.S. military operations—as a way to disrupt ongoing U.S. operations, seize the initiative, and redefine the conflict on their own terms.

Advances in biotechnologies and information technologies are creating new opportunities for adversaries to expand a conflict and create widespread disruption. The globalization of biotechnology industries is spreading expertise and capabilities and increasing the accessibility to biological agents that may be suitable for a disruptive biological attack as part of an adversary's unrestricted warfare strategy. Also, foreign perceptions of increasing U.S. military and economic dependence on information systems could lead future adversaries to consider attacks against U.S. networks and communication capabilities.

The recent conflicts in Iraq and Lebanon will likely foster interest by both state militaries and non-state groups in adopting irregular warfare strategies as their primary warfighting approach for countering superior military forces. The elevation of the importance of irregular warfare in the perception of potential U.S. adversaries will likely lead to new challenges to U.S. ground forces and peacekeeping operations. Furthermore, advances in information, communication, sensor, and man-portable weapon technologies have the potential to increase the effectiveness of future foreign irregular warfare operations. Such capabilities might also be exported by states to proxies along with other modern weapon systems to increase their effectiveness against U.S. or allied military forces as part of an unrestricted warfare strategy.

Changing international attitudes towards war and the use of military power are likely to be exploited by adversaries pursuing an unrestricted warfare campaign. "Media warfare" is likely to become an increasingly important element in future wars as adversaries seek to exploit advances in mass communications and other electronic media to manipulate public opinion and organize local and widespread opposition to U.S. forces and interests. In addition, some experts have argued that changing attitudes towards war might lead to an "asymmetry of brutality" in future conflicts. The United States and its allies will seek to restrict the level of violence and destruction in future conflicts because of adherence to moral and legal standards and through the employment of precision weapons. However, potential adversaries pursuing unrestricted warfare strategies might see advantages to raising the level of violence and brutality to undermine U.S. resolve, influence public opinion, and provoke a U.S. response that would be supportive to their cause.

> *"The Intelligence Community is particularly vulnerable to surprise by rapidly changing and readily available emerging technologies whose use by state and non-state actors, in yet unanticipated ways, may result in serious and unexpected threats."*

Emerging unrestricted warfare capabilities will pose new defense challenges for the United States and its allies. Increasing threats from long-range weapons, cyber attacks, and terrorism will affect the security interests of the United States and its allies alike. Mutual development of defensive strategies and capabilities to deal with these threats will be critical in countering future adversary attempts to coerce using an unrestricted approach to warfare.

A COLLABORATIVE INTELLIGENCE COMMUNITY

How well are analysts positioned to assess and warn about emerging strategic challenges such as those posed by foreign unrestricted warfare concepts? In its 2005 report to the President, the Robb-Silberman Weapons of Mass Destruction (WMD) Commission examined the capabilities of the Intelligence Community in the aftermath of the Iraq WMD; and estimates noted deficiencies in long-term research and strategic thinking in the Intelligence Community. The Commission found that the drive to fill "current intelligence" requirements had crowded out work on strategic military issues by the Intelligence Community. Furthermore, the Commission's report stated that the Intelligence Community was particularly vulnerable to surprise by "rapidly changing and readily available emerging technologies whose use by state and non-state actors, in yet unanticipated ways, may result in serious and unexpected threats."

Since the publication of the WMD Commission's report, the Intelligence Community, under the direction of the Director of National Intelligence, has taken steps to address the imbalance of intelligence analysis towards "current intelligence" by promoting analysis that is both "wide"—cutting across traditional analytical accounts—and "deep"—having a long time horizon. Of particular note is the establishment within the National Intelligence Council of the Long Range Analysis unit. The purpose of this unit is to focus on long-term, strategic analysis and to alert policymakers to strategic trends that are evolving in such a way as to potentially threaten U.S. interests. In particular, this unit seeks to promote collaboration between the Intelligence Community and nongovernmental experts in understanding and assessing issues and trends that may have gone unnoticed or underappreciated if our focus was strictly on current developments. The Long Range Analysis unit, for example, just published an assessment on the changing character of warfare that summarized the findings of a collaborative effort among intelligence analysts and nongovernmental experts to assess emerging threats to the U.S. way of war.

CONCLUSION

Let me conclude by citing six recommendations for how the Intelligence Community can continue to position itself to best understand and warn against new foreign approaches to warfare and emerging threats to U.S. strategic interests:

1. **Understanding the implications of emerging adversary capabilities and strategies requires a holistic approach to analysis.** By this, I mean that it is not sufficient to assess technology developments alone in identifying future threats. Rather, analysts should examine the synergy between technology developments, emerging foreign capabilities and concepts for future war, and geostrategic political and security dynamics. Analysis that is organized into separate functional and regional areas will be ill-suited to addressing complex interdisciplinary issues such as the challenges posed by unrestricted warfare strategies. Such issues require strong integration among the analytic, technology, and strategy communities—which, I am pleased to see, is a major theme and goal of this symposium.

2. **Red teaming and exploratory analysis are useful tools in understanding new foreign approaches to warfare.** Traditional evidence-based, linear, deductive analysis is often insufficient to address complex problems such as emerging unrestricted warfare strategies that can challenge prevailing assumptions and linear trend projections. Red teaming of future foreign warfare strategies that takes into account foreign threat perceptions, military culture, leadership dynamics,

technological acuity, and societal norms can be useful in identifying potential doctrinal and technological developments that could be disruptive to U.S. security interests. Such analytical techniques are especially important where there is a dearth of current information on the capabilities and strategies of a potential future adversary because those technologies help determine which indicators might reveal the emergence of a new threat.

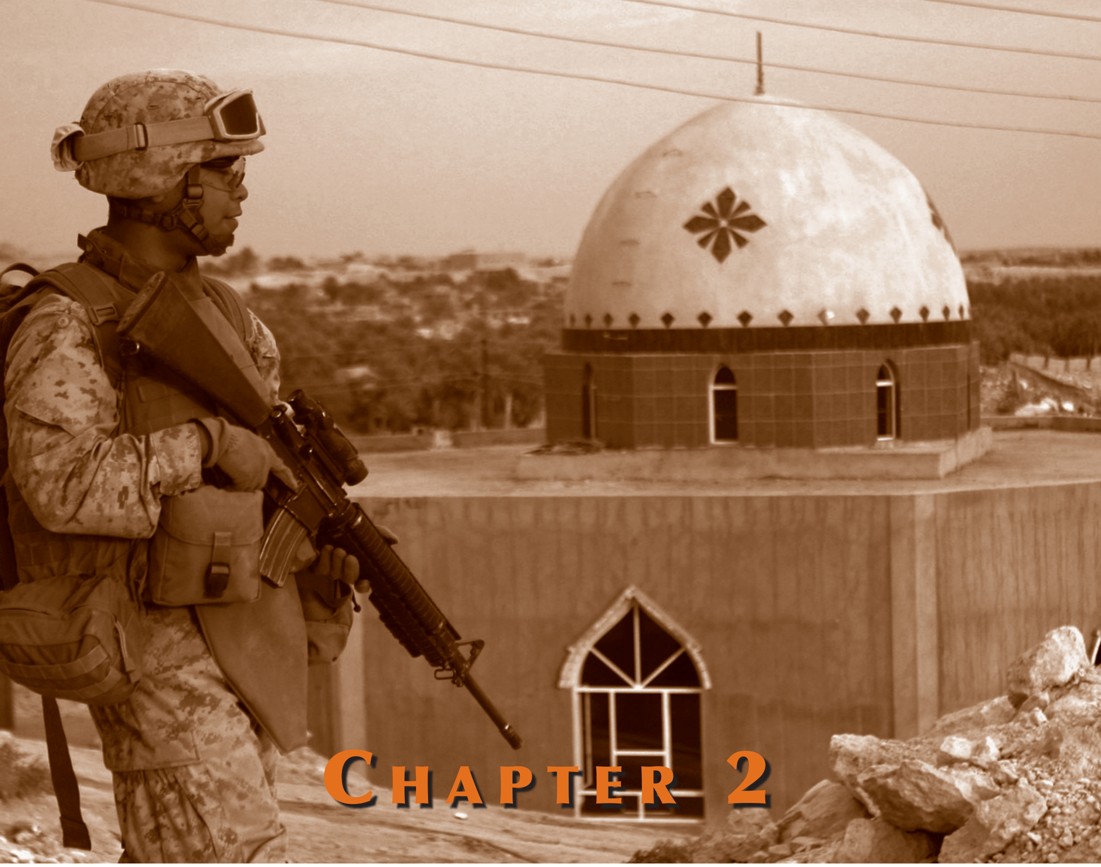
3. **Understanding foreign motivations, intentions, and perceptions of U.S. military capabilities, objectives, and vulnerabilities is key to warning of emerging threats to U.S. interests.** Understanding when an adversary perceives it has the necessary capabilities to deter or disrupt U.S. military operations is as important as knowing the technical characteristics of those capabilities. Failure to understand foreign perceptions could lead to the United States being surprised by preemptive or escalatory actions taken by an adversary convinced of its ability to disrupt U.S. military operations or undermine U.S. political resolve.

4. **Analysts should be cognizant of potential foreign attempts to use mass media to influence and manipulate perceptions.** Foreign media warfare and other influence activities are likely to be a part of a future unrestricted warfare strategy; therefore, analysts need to be prepared to recognize and warn of such efforts.

5. **Analysts should also examine potential future events that can be disruptive.** Global epidemics and widespread environmental disasters are examples of events that could significantly impact international security dynamics and future U.S. military operations. Our adversaries might seek to

exploit such events for their own benefit. Scenario-based analysis can be helpful in anticipating such strategic changes, assessing their potential implications for U.S. interests, and assisting analysts in identifying important dynamics that would otherwise be missed in a narrower analytic approach.

6. **The analytic community needs to ensure that analysts remain properly trained, organized, and rewarded for addressing complex, multidisciplinary, strategic, and long-range issues.** This is critical to ensuring that the analytic community maintains a sustained effort to collect, examine, and warn against emerging strategic issues such as the foreign development of unrestricted warfare strategies and capabilities. Failing to do so risks a return of the imbalance in analysis towards current developments that the WMD Commission identified.



Chapter 2

STRATEGIC POLICY ROUNDTABLE

The Nature of URW

2.1 MODERATOR'S SUMMARY

Thomas Keaney

A familiar aphorism among military planners holds that getting the strategy correct can bring success in spite of many tactical errors, but excellent tactics applied to an incoherent strategy will lead nowhere. Such a principle also applies to addressing the nature of URW. Thus, an examination of needed methods of analysis and technologies should begin with some understanding of the strategic circumstances in which they must operate. Hence, this session makes projections on the nature of the threat, the strategic context, and options for dealing with URW.

While it examines possible contingencies, this session makes no claim to project a future U.S. policy or strategy. Instead, the presentations set forth some of the dimensions that a strategy must consider. Needless to say, no one panel session can encompass the range of factors involved; but addressing some of the key factors and projected international developments sets a valuable context for later discussions. With that caveat and an awareness of how little we can know of the future, these presentations look at likely scenarios for U.S. military involvement and provide more specific examinations of the possible roles of WMD in warfare.

Professor Thomas Keaney of the Paul Nitze School of International Studies at The Johns Hopkins University is also the executive director of the Foreign Policy Institute, the Merrill Center for Strategic Studies, and senior adjunct professor of Strategic Studies at SAIS. He is a former professor of military strategy at the National War College, Air Force Academy; planner on the Air Staff, Forward Air Controller in Vietnam; and B-52 Squadron Commander.

Despite current and intense U.S. involvement in counterinsurgency operations in Afghanistan and Iraq, this panel will not explicitly address those countries or counterinsurgency in general. As Dr. Ron Luman mentioned earlier, at the first symposium on URW, held last year, the focus was heavily on counterinsurgency operations in those countries and on the Global War on Terror in general. This symposium should be seen as a complement to last year's event, with the two together providing a broad-based assessment of the future strategic landscape.

In the first presentation, Michael O'Hanlon looks at regions in Asia in which conflict could motivate large-scale U.S. involvement. Rather than just a listing of possible conflicts, his analysis of the region delivers more substantial judgments. First, he presents the relative plausibility of each scenario and the likelihood of U.S. involvement. Then, he estimates the kinds of military forces or capabilities that might be required. Finally, he discusses the probable objectives of the combatants involved, setting in proper context the stakes of U.S. force involvement. While areas outside Asia have the potential for deadly conflict involving the United States, possible scenarios involving states ranging from North Korea to Pakistan to Iran encompass some of the world's most critical and most dangerous situations that planners must consider.

The Asia Pacific region offers not only potentially the most serious battlegrounds but also includes countries identified now as most active in the acquisition and proliferation of WMD. The possession of WMD by states such as North Korea or Iran or by non-state actors poses particular problems. In addition, the long-standing enmity between India and Pakistan, two nuclear states, raises the possibility of use of nuclear weapons. It is with these dangers in mind that the remaining two presentations of the panel focus on WMD and their potential use.

Dr. Brad Roberts lays out a framework for evaluating the WMD threat. Far more than just an estimate of weapons' capabilities, Dr. Roberts proceeds through an analysis of why WMD has not yet been used in the post-Cold War setting, differentiating between the motivations of states and non-state actors and between the various conditions that might encourage or discourage the use of these weapons. His explanations of why states have not used WMD not only provides a corrective to much of what passes for fear-mongering on the possible use of these weapons, it also invites consideration of what happens when or if past impediments no longer apply. Most importantly, Dr. Roberts sets the discussion of WMD in the strategic context of the circumstances in which WMD might be used and the types of weapons that would have most or least utility. Finally, his analysis of WMD considers both basic elements of a threat: its capability and intent.

Building on the presentation of Dr. Roberts, Prof. Mary Habeck deals specifically with how radical Islamists—she uses the term jihadists—view the possible use of WMD and how those perspectives may be changing. Her presentation looks closely at the history of Islamic teaching on the treatment of non-combatants, warfare with non-Muslims, and the rules of war in which Islamic forces are engaged. Dealing specifically with the issue of the barriers to WMD included in Dr. Roberts' presentation, Prof. Habeck outlines how in recent years jihadist proclamations have declared previous restrictions in the conduct of warfare no longer valid. Her conclusions indicate a serious and immediate threat of WMD use against U.S. forces and the United States itself.

These three presentations introduce important perspectives on the nature of the threat and areas of possible involvement for U.S. forces. Together with last year's addressal of the threat environment, they provide an essential framework for establishing priorities of needed analysis and technological developments that will be discussed at this year's URW symposium.

2.2 SCENARIOS FOR FUTURE CONFLICTS

Michael O'Hanlon

This article discusses five places in the Asian littoral where the United States must be prepared for future conflicts. Although wars in these areas cannot be predicted with any kind of definitive likelihood, the scenarios are plausible enough that the U.S. has to prepare. This kind of exercise helps us frame the broad discussion about U.S. strategy, defense budget choices, the kinds of technological capabilities we must develop to meet these challenges, and the kinds of asymmetric threats with which we must be most concerned.

INTRODUCTION

Forgive me for beginning this with a golf joke, but it has a relevant moral. The joke is partially based in reality—the time that Tiger Woods and Bill Clinton played golf together. Clinton teed off first and sliced the drive badly, and it went into the woods. Since this was the first hole and he was playing the best golfer in the world, President Clinton did not feel it was too unreasonable to give himself a mulligan. So Clinton hit the next drive, and this

Michael E. O'Hanlon is a senior fellow in Foreign Policy Studies at the Brookings Institution, where he specializes in U.S. defense strategy and budgeting, homeland security, Northeast Asian security, and humanitarian intervention. He is also adjunct professor at the Public Policy School of Columbia University, a visiting lecturer at Princeton University, and a member of the International Institute for Strategic Studies and the Council on Foreign Relations. He is a frequent op-ed contributor and television speaker and has written a book on defense strategy for the post-Saddam era; another on the use of the military for humanitarian intervention; and most notably, one on protecting the homeland.

one hooked way left. It is somewhat inappropriate to take two mulligans on the same hole, but the weather is cold and Clinton is in his 50s—he needs a little time to loosen up—and he's playing Tiger, so he takes a second mulligan. He hits his next drive straight down the fairway—except it goes into a pond. He gives himself a drop and hits his next shot onto the green. Tiger, meanwhile, plays a fairly uneventful hole and pars it with a couple of putts. Clinton's shot from behind the pond lands about eight feet from the pin, so Clinton picks up his ball and says, "Tiger, I just beat ya. I had a three on that hole." That's the Bill Clinton part of the story, and that part is (mostly) true.

The next part, which is also true—at least in terms of how the North Korean press reported this particular outing—is that Kim Jong Il recently played his first round of golf. According to the Korean press reports, of the 18 holes he played, he had a hole-in-one on eight of the holes. The North Korean press did not give the detailed scoring on the other nine, but I think we can safely assume his overall 18-hole score was somewhere in the range of 30 to 35 based on this initial assessment of the holes-in-one. That story tells us a little bit about the North Korean regime and the nature of who we might have to face there.

Finally, even though we all love the Chinese—and, in fact, this story is a little bit complimentary—Hu Jintao played his first round of golf. Instead of bothering with any kind of fabricated story, the Chinese had Hu Jintao go out into a forest and hit 18 balls, and in the next 4 hours, they built a golf course around those 18 shots to make sure that his balls wound up in the right place. That story reminds us about the nature of whom we are potentially dealing with in this world, their capabilities and their strengths, and how they sometimes have certain asymmetric advantages over us.

POTENTIAL FOR CONFLICT IN THE ASIAN LITTORAL

I will begin with two scenarios that I do not propose we plan against—I will not address each and every scenario I can possibly contemplate. I just want you to imagine the different scenarios around the world in which we could possibly fight. My criteria for assessing the plausibility of the scenarios are likelihood of the initial conflict, likelihood of sufficient U.S. strategic engagement or interest to get us involved, and whether we get involved directly to reverse whatever aggression or operation is at issue or take a more indirect approach. I want to start with two that do not meet these criteria.

Unlikely Scenarios

The two unlikely scenarios are a possible Russian attack on the Baltic States and a future Chinese threat to the Korean peninsula. A Russian attack on the Baltic States used to be in Paul Wolfowitz's list of possible scenarios when he was Undersecretary of Defense for Policy in the first Bush administration. The defense planning guidance that was leaked to the newspapers at that time had six or seven scenarios. That guidance was the genesis of the whole two-war framework, and it was ultimately concluded that the North Korea/Iraq simultaneous scenario was the most demanding. One of the other scenarios on that list was a Russian threat to Latvia, Lithuania, or Estonia; and we can all remember the argument about why this kind of scenario was plausible.

Now, of course, those three countries are members of NATO. So in one sense, we have an even more direct obligation to worry about their potential for being attacked and our potential for having to respond. Vladimir Putin, despite today's news about his willingness to be a little tougher with Iran, has not been a great friend of the United States recently, as evidenced by his engagement with U.S. Defense Secretary Robert Gates a few weeks ago in Europe.

You could say the Russian scenario is very real and serious, and one we should plan against. Even though we have an Article V commitment to the Baltic states, if this scenario ever did transpire, my argument would be that the military disadvantages of responding in that particular setting in a direct, symmetrical way would simply be too great to be worth the trouble and strategic risk. The United States would be much better off organizing a Cold War-like economic squeeze of Russia than trying to respond directly with ground forces.

For any Russians in the audience, I apologize for starting with this kind of a scenario—I do not mean to sound Russia-phobic. In this business, when we think about scenarios, we have to be a little bit imaginative and think through the what-ifs. Who would have thought 10 years ago that the U.S. would be fighting in Afghanistan? I am using these examples to broaden the scope of imagination far enough to be prudent.

I submit to you that the Baltic State scenario is a) unlikely, and b) even if it occurred, a much better strategy would be to respond indirectly. So I will take that scenario off my list and move to Korea—one Korean scenario I think we do have to worry about—but I will get to that next. The scenario that I would submit we do not have to worry about in direct military terms is a future Chinese threat to the Korean peninsula. I am sure that the experts at this URW symposium who study Korean issues are well aware from Chinese writings and political discourse, that Chinese claims to portions of the Korean peninsula date back to kingdoms that existed over a millennium ago. How do we confidently project that China, with its growing population, its thirst for resources, and its historical claims, would never threaten either Siberia or Korea? I would submit that:

1. China has too much of a real interest in staying engaged in the world economy to bother with that kind of limited territorial acquisition, which all of China's major economic partners would consider unjustifiable.

2. Getting into another land war with China on the Asian landmass would not play to our strategic strengths.

If this unlikely scenario were ever to happen, the proper American strategic response should be to organize a combination of naval and economic sanctions that would penalize China until it reversed its aggression. If necessary, we could be patient and wait many years for the situation to play out. This is not a major scenario—certainly not for ground force planning.

Likely Scenarios

North Korea Nuclear Facilities

Now, I will propose some scenarios that I think we do have to worry about. All of us in the community of defense specialists have thought about these issues. Nobody here is naïve about Korea, and many of you know a good deal more about it than I do. The point I want to make is that a Korean conflict is still plausible, although I hope it is somewhat less plausible now because of the recent negotiations and progress towards putting the North Korean Yongbyon nuclear facility under wraps and, ultimately, I hope, dismantling it. If that agreement falls apart, or if the North Koreans make progress on their underground uranium enrichment program, we may feel that we have to destroy that fissile material production capability to keep North Korea from becoming a "nuclear Wal-Mart." Under that scenario, I do not think it is plausible that the U.S. would simply invade North Korea.

However, under certain circumstances, I think it is plausible that the U.S. would decide to launch a surgical strike against North Korea's nuclear capabilities using air power and maybe even Special Forces. It is unlikely the U.S. will ever find Korea's existing weapons and be able to target them in this kind of a raid, but we could target their fissile material production capability and likely would consider doing so. You may remember that Secretary Bill Perry basically threatened this kind of strike in 1994 at the very moment when the Clinton administration was having troubles being tough even in Somalia and Rwanda and Bosnia; yet, Perry threatened a far more capable potential enemy when he said on national TV, "We will not let the North Koreans develop a nuclear arsenal." Jimmy Carter offered Kim Il-sung the carrot of direct dialogue with the United States in exchange for North Korea's cessation of its nuclear program, and he wound up with a pretty nice carrot–stick policy that helped lead to the agreed framework.

If Perry could make that threat then, it is plausible that a future Secretary of Defense would do the same thing. In fact, I am surprised the Bush administration has not done something similar in the last 5 years—obviously, the focus on Iraq made it harder to use a similar kind of coercive diplomacy against North Korea. I hope very much that the new deal that Assistant Secretary of State Christopher Hill has negotiated will make this threat unnecessary in the future. However, if North Korea ever resumes construction on these big reactors, a war could get started. If the U.S. were to strike those reactors, no one knows what the North Koreans would do next. That is why we have to keep Korea on the planning horizon.

Taiwan Strait

Another scenario that I think we still also have to keep in the portfolio of possible contingencies for U.S. military planning is the Taiwan Strait. That contingency has been on our national list one way or another for more than 50 years, going back to the days of Eisenhower and the nuclear threats towards China in the 1950s over Taiwan. This issue was of acute concern in the mid-1990s after the Chinese missile strikes led to beefed-up American carrier deployment in the Taiwan Strait vicinity.

"I had not fully appreciated the nuance of sovereignty versus independence until Richard and I did this book; many Taiwan leaders see pursuing more sovereignty as totally legitimate."

Since that time, things have cooled off a little bit. However, I would like to present a scenario that is informed by historical conflicts discussed in a book I coauthored with my colleague, Richard Bush, who is a Taiwan expert and has been studying the intricacies of Taiwan domestic politics.[1] A real possibility exists, just as we have seen with President Chen Shui-bian, that some future Taiwan leader will decide to push the independence issue far enough to provoke China. Richard, who is a huge supporter of

[1] Richard Bush and Michael O'Hanlon, *A War Like No Other: The Truth About China's Challenge to America*, Hoboken, New Jersey, John Wiley & Sons Inc., 2007.

Taiwan, has helped me appreciate some of the ways in which this scenario could come about.

The leaders of Taiwan see their role in the world as being inappropriately curtailed by China. Even if they are prepared to say they do not want independence right now, they want more sovereignty, more independent decision-making capability, and more standing in various international organizations even if they are technically not considered to be a nation state by the international community. I had not fully appreciated the nuance of sovereignty versus independence until Richard and I did this book; many Taiwan leaders see pursuing more sovereignty as totally legitimate.

Many U.S. officials also see Taiwan's pursuit of sovereignty as entirely reasonable. However, U.S. policy is to keep the Taiwanese from pursuing outright independence. That is a very fine line to walk: "You can go ahead and get more sovereignty but not more independence." Let's hope these two words translate well into Chinese and that the Chinese always make the same distinction that we do between the two and understand what the Taiwan leaders are doing for domestic political reasons versus for international reasons. The Taiwan Strait issue is not over yet.

My contribution to *A War Like No Other* was to think through the dynamics of crises and conflict decision-making and escalation as we potentially get into a shooting war with China over Taiwan, especially in the event of what I call a "leaky blockade," where China is smart enough not to try to invade but simply tries to curtail commercial traffic in and out of Taiwan through the use of the occasional submarine hit-and-run patrol. What does the U.S. do in response? If we deploy more naval assets to the region, the Chinese may back down for a while, or they may try to sneak one submarine through and shoot out a ship or even try to hit a carrier—or make us worry that they could. Certainly, they would keep the pressure on the Taiwan economy. No one knows how this situation will play out. If it takes several months or years to play out, it is not clear that we will be able to sustain this kind of a naval presence in the western Pacific to guarantee access for ships in and out of Taiwan. China may find that it has the upper hand. It is not clear who would then escalate to a higher level of conflict—would the United States want to start attacking Chinese submarines in their ports as a way to prevent them from continuing this blockade? If the U.S. did so, how would the Chinese respond once the U.S. had hit at PRC territory? The potential for escalation is high, and the U.S. would face many challenges in the ASW, anticruise missile, and antiballistic missile realms as well as broader strategic questions.

Three More Scenarios

I will now briefly present three different scenarios. The scenarios I have discussed so far play to U.S. naval capabilities and air power. In the case of Korea, the scenarios involve U.S. ground forces as well. In South Korea, the U.S. is fortunate to have an ally that has developed good ground forces over the years. Therefore, one could make the argument that, in east Asia, the U.S. can ratchet back its focus on ground forces once the Iraq operation is concluded and possibly realize Donald Rumsfeld's transformation vision after all—in which the U.S. relies more on its air power, high-technology, and naval strengths and less on its ground forces. However, I do not think that is going to happen—and south Asia is one of the main reasons why.

The two scenarios regarding south Asia involve the collapse of Pakistan and an Indo-Pakistani war over Kashmir. I will begin with Kashmir.

Kashmir Scenario

India does not want any other nations to intercede or even discuss Kashmir—it does not want any help diplomatically. The U.S. would never forcibly intervene to stop the kind of war that an Indo-Pakistani war over Kashmir represents. The U.S. is not going to become involved in the business of deciding who should rule Kashmir or whether it should be independent, trying to insert a million-person-strong ground force into Kashmir, or forming a NATO coalition to make sure that it is liberated. If the Indians and the Pakistanis begin another conflict over Kashmir and, this time, they do not ratchet down the confrontation quickly, the possibility of nuclear escalation exists.

If the possibility of nuclear escalation increases or nuclear weapons are used, what does the world do? Do we really stand by and let India and Pakistan kill 100 million people in South Asia and say that we are going to stay out of this conflict because we have no formal strategic commitment to either country? I do not think so, especially because any scenario involving Pakistan's basic cohesion as a nation and the future security of its nuclear arsenal are of intense strategic concern to us. I will say more about that in a second. I think it is highly possible that, if an Indo-Pakistani war escalated to the point where use of nuclear weapons was likely, the international community would get extremely involved.

What we would say to India and Pakistan—and they may even be saying this to us quietly at that point—is: "We are prepared to offer trusteeship for Kashmir, robust international monitoring of Kashmir's borders to keep infiltrators and terrorists out, and, in 10 or 20 years, some kind of a referendum process for Kashmiris to determine their own future. India, you will not like this, and Pakistan, you will not like this that well; but if the alternative is nuclear war, maybe you will like it better than you used to." That means that, all of a sudden, NATO is deploying a couple hundred thousand forces to Kashmir and sustaining them for many years. I think that is a distinct possibility. Let's hope the Indians and Pakistanis are on the way towards solving Kashmir—or at least realizing they cannot afford military escalation to resolve the problem, but I am not confident. Like my other scenarios, I think there is at least a 5% to 10% chance that this could go the wrong way in the next decade or two.

Pakistan Collapse

None of these scenarios is meant to be overly fear-mongering. I do not think any of them are super likely. I can see a 5% to 10% chance of most of these scenarios happening and potentially involving U.S. forces in the next couple of decades. If the Pakistan state collapses suddenly, it is too late. The U.S. cannot get enough forces there to make any difference. If Pakistan begins to fray over time and the state asks for international help to shore up stability, it is implausible that the U.S. would say no. Because of its nuclear arsenal and the potential for it to get into the hands of Islamic radicals, a collapsing Pakistan is just as great a threat to our security as a Soviet invasion of Europe would have been in the post-World War II/Cold War era.

Iran

I only have one scenario left—Iran. Similar to the situation with North Korea, if we bomb Iran's nuclear facilities, no one knows what will happen next. I do not think the Iran scenario is likely to lead to all-out invasion and regime overthrow. However, I think there is a distinct possibility of a much more engaged, longstanding Persian Gulf-kind of conflict, with Iranians using cruise missiles, antiship missiles, torpedoes, and sea mines against U.S. forces and those of our allies in the region. We would essentially have another "war of the tankers" in response to a U.S. strike on Iranian nuclear facilities. I am not trying to suggest this is likely, but there is enough of a possibility that I think we have to plan for that too.

CONCLUSION

There are many possible scenarios besides the ones I have discussed here. We all know in this business that unpredictable things happen. When I applied my criteria for assessing the plausibility of major conflicts, I came up with five or six big candidates—not even counting Latin America and Africa—just looking at the Eurasian littoral, where I think the U.S. has to create and sustain a broad range of capabilities to be reliable custodians of our future security.

2.3 CALIBRATING THE WMD THREAT

Brad Roberts

INTRODUCTION

Most American experts who worry about the problem of unrestricted warfare have a fairly clear view of the nature of the WMD threat: It's a given. We Americans tend to view weapons of mass destruction as the quintessential tools of asymmetric warfare. Our national concern about WMD has grown steadily more pronounced over the last two decades as the Cold War receded and new problems emerged associated with both state and non-state adversaries that could not face the United States in symmetric military terms and expect to win—or even to survive. As many experts and policymakers have argued, "It's not a matter of if but when."

But this fairly clear view must be squared with actual experience. In the period since the end of the Cold War, the U.S. military has been heavily engaged overseas; but not a single state adversary has chosen to employ WMD against U.S. forces or other interests. Even in those wars where the United States sought to remove a regime (Milosevic, the Taliban, and Saddam), the WMD threat did not materialize. Non-state actors too have not met U.S. expectations in this regard. In the many thousands of terrorist

Dr. Brad Roberts is a member of the research staff at the Institute of Defense Analyses in Alexandria, VA. He is also a member of DoD's Threat Reduction Advisory Committee and an advisor to the STRATCOM Strategic Advisory Group. His recent publications include Deterrence and WMD Terrorism: Calibrating its Potential Contributions to Risk Reduction (IDA, 2007).

incidents in the last two decades, only a very small handful have involved the use of chemical, biological, radiological, or nuclear materials. Moreover, none sought to exploit their full lethal potential.

I invite you to recall the words of Sherlock Holmes, in a Sir Conan Doyle short story entitled *"Silver Blaze:"*

> *Inspector Gregory: "Is there any point to which you wish to draw my attention?"*
>
> *Sherlock Holmes: "To the curious incident of the dog in the night-time."*
>
> *Gregory: "The dog did nothing in the night-time."*
>
> *Holmes: "That was the curious incident."*

I am interested in the dog that did not bark. Why hasn't this dog barked, and what do we do about that? How should we understand this stark contrast between expectation and reality? Have our fears been exaggerated? Or is it simply that, so far, U.S. adversaries have simply been incompetent in their attempts to employ these capabilities? To explore these questions, I will explore first the interests of terrorists in WMD and then rogue states.

"I am interested in the dog that did not bark. Why hasn't this dog barked, and what do we do about that?"

Answers to these questions are helpful to calibrating the WMD threat. It is important to do so because this offers a contrast to the polar extremes of fear-mongering coming from some segments of the counterterrorism community and the complete complacency that grips other parts of this community.

TERRORISTS AND WMD

Decades ago, Brian Jenkins, terrorism expert and advisor to the RAND Corporation and the National Commission on Terrorism, expressed a key insight into terrorist objectives:

> *"Simply killing a lot of people has seldom been a terrorist objective. Terrorists want a lot of people watching, not a lot of people dead. Terrorists operate on the principle of the minimum force necessary. They find it unnecessary to kill many, as long as killing a few suffices for their purposes."*

Terrorists motivated as described by Jenkins accordingly had little interest in weapons of mass destruction. They cranked up the volume of violence loud enough to get attention to their cause and also to win concessions. But they had to worry about the problem of killing too many—of alienating key sponsors and enablers, of offending those whom they purported to represent, of turning internal opponents into police informers.

But in the 1990s, this form of terrorism seemed to wane and something more sinister to take its place. The bombings of the World Trade Center and then the federal building in Oklahoma City; Aum Shinrikyo chemical attacks in Japan; and al Qaeda's unfolding actions in Africa, the Middle East, and elsewhere signaled a radical shift in terrorist ideology and objectives. Private constituencies and radical religious ideologies overshadowed public constituencies. Ambitions became revolutionary in the broadest sense, and the terrorist innovators became motivated by a desire to kill in much larger numbers. This has led one commentator on Jenkins' work to argue as follows:

"In today's world, marked as it is by groups such as al Qaeda, it is no longer true that terrorist groups don't want a lot of people dead. It is, however, still very much the case that they want a lot of people watching."[1]

[1] hsgac.senate.gov/_files/050307Doran.pdf: Statement of Michael S. Doran, Deputy Assistant Secretary of Defense Support to Public Diplomacy before the Committee on Homeland Security and Governmental Affairs, United States Senate, 3 May 2007.

In our national discussion about terrorism, the focus typically is on how much traditional terrorism has been replaced by new forms of transnational and religiously inspired terrorism. We should not forget that some of the old faces of terrorism remain. These include terrorist loners, national separatists, and even the occasional right wing militia group. Moreover, many al Qaeda affiliates fit Brian Jenkins' aphorism very well. They are after governance, territory, and legitimacy; and this thrust constrains their interest in mass casualty attacks.

But what about the "new faces" of terrorism? What purposes guide their thinking about the differences between killing enough and killing too many? It is helpful to distinguish between apocalyptic, catalytic, and instrumental purposes.

Apocalyptic – To destroy Western society. Supporting evidence is psychological gratification of mass casualties and motivation of "holy duty" to acquire WMD. However, the 9/11 attackers did not kill "as many as possible." They killed enough to make us fearful where we had felt safe and to damage powerful societal symbols.

Catalytic – To unleash pent-up resistance to Westernized and corrupt regimes, to induce U.S. overreactions that would discredit it, and thereby to change the regional status quo.

Instrumental – To generate fear in America to induce military disengagement from the Islamic world.

In my view, within the militant Islamic extremist movement, each of these purposes is at play, albeit at different times and in different ways. This uncertainty does not make it very easy for us to calibrate how much incentive and restraint they have when it comes to mass casualty attacks. Accordingly, very many different opinions have crept into our national debate about how to explain the gap between our expectations of WMD terrorism from Islamic extremists and our experience—so far, of course. Collected in Figure 1 are some of those opinions.

Various Propositions in the Debate:

1. The al Qaeda leadership core is scattered or destroyed and thus incapable of strategic guidance to the campaign or of sustaining the special programs for "terrorist spectaculars."
2. The rank and file are less energetic, competent, and capable of innovation than the leadership would have hoped.
3. State sponsors have pulled back their support for fear of going the way of the Taliban and now Saddam.
4. Usama bin Laden (UBL) does not need a game-changer now because:
    a. This is an epochal struggle, and his focus is now the Near Enemy.
    b. He sees things unraveling in the Umma in ways that serve his interests.
    c. It took a decade to crush the USSR, and the Iraqi outcome looks promising.
5. Like Saddam in 1991, UBL went to war without ready WMD.
6. The use of WMD does not fit the jihadist theory of victory.
7. The phase of war has not yet arrived for which al Qaeda leaders conceive and prepare the use of WMD—in defense of the restored Caliphate.
8. Exploitation of the full lethal potential of WMD requires mastering and combining various skill sets. Although this is not insurmountable, it requires a culture of

Figure 1 Why Has WMD Not Been Used So Far in a Decade of War?

Let me offer a few comments on some of these hypotheses.

If Proposition Number 2 is valid, the leadership of al Qaeda must be hugely frustrated. The attacks of 9/11 were evidently intended in part to inspire young Muslims to take up jihad and attack vulnerable enemies, both near and far, and to act without central direction or support from al Qaeda. So far at least, the degree of innovation has been unimpressive; there have been very few activities by jihadists that are not in the playbooks used in the training programs in the camps in Afghanistan. So far at least, they seem not capable of conceiving, planning, and executing WMD attacks.

"Calibrating the threat offers a contrast to the polar extremes of fear-mongering coming from some segments of the counterterrorism community and the complete complacency that grips other parts of this community."

Proposition Number 4 in Figure 1 suggests that Osama bin Laden is not interested now in using WMD, but he might be interested later. By this way of thinking, he is not interested now because global jihad is generally taking history in his preferred direction; and he does not need a game-changer now. Indeed, the game-changer might be counter-productive.

Proposition Number 5 definitely has some validity. Recall that Saddam went to war without WMD twice. It may be that al Qaeda made the same choice.

Proposition Number 7 highlights the possibility that al Qaeda leaders are waiting for the next phase of the war to develop their WMD capability and strategy. That phase would come when they succeed in restoring a functioning Islamic Caliphate. Recall what bin Laden said when asked if al Qaeda was pursuing nuclear weapons: "Of course we should want to have them. It is a holy duty to acquire them." He did not use the word "deterrence," but the notion reflected in his comment seemed to be that, if the West can do damage to Muslims with these weapons, al Qaeda must have them too to prevent such damage. It may be that this image of deterrence is associated with the time when the Caliphate has been restored. By this logic, al Qaeda would not use nuclear weapons in the early revolutionary period; it would save them to use as coins of power to shape the presumably hostile environment around the restored Caliphate.

"The most capable of conducting WMD attacks may lack the motivation."

Proposition Number 8 in Figure 1 raises a key point about innovation. Innovation has proven to be extremely difficult for many types of organizations. Is this also true for terrorist organizations? Such innovation is essential to bringing together the needed expertise and skills to create and employ WMD. Scientists and engineers from laboratories such as the Applied Physics Laboratory well understand the need to nurture a systematic and experimental mindset in the laboratory environment. Experimentation requires a culture in which failure is rewarded because such failure is the shortest route to needed learning. Failure is not highly prized in terrorist movements. Some of the al Qaeda leadership seems to tolerate a fair amount of it but not a lot.

Al Qaeda's WMD Incentives and Restraints

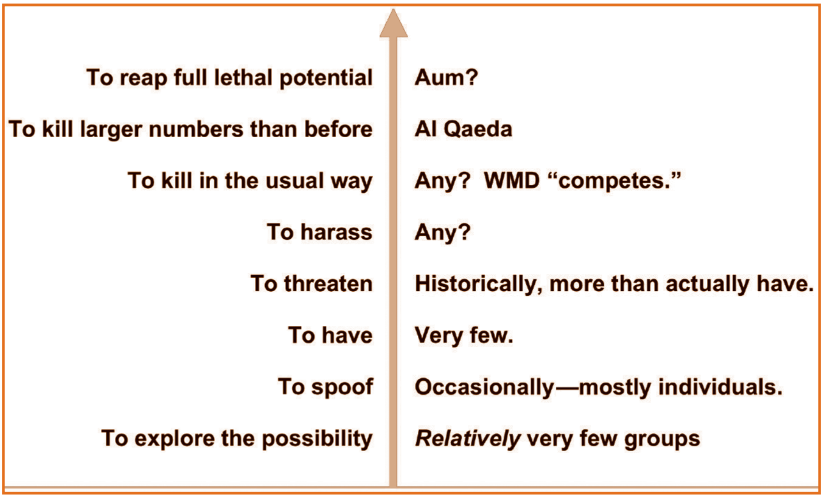
Let me return to my main question: why have terrorists not so far embraced WMD? The preceding discussion suggests that their intentions may not be well formed or their capabilities not well developed. Let me now pose a more specific question: why have the myriad elements in the al Qaeda network not so far embraced WMD? The following graphic (Figure 2) sketches out a way of thinking about this question. It builds on the observation that the al Qaeda network is, in fact, a network of disparate elements, each with its own incentives and restraints.

Node or Group	Characteristics
Jihadists	• Most are motivated by a desire to wage jihad, not mass murder. • Untrained jihadists are very unlikely to successfully exploit CBRN. • Trained jihadists know CB training module and see CBW as unproven.
Affiliate Groups	• They often have the "interests" of traditional groups—and they compete for legitimacy. • The professionals described below train most.
Professionals	• Practice a proven art and weigh alternatives against known means. • Dedicated to the profession, not necessarily the cause. • Show no interest in putting ties to states at risk.
Leaders	• Motivated to conduct highly impressive terrorist "spectaculars." • Seek legitimizing context of fatwas. • Concern themselves with the long-term viability of the movement and thus the interests of their "coalition" members.

Figure 2 WMD Restraint at the Top Versus in the Network

This suggests a couple of important insights. First, the most motivated may lack some of the essential capabilities. Second, to conduct WMD attacks that reap the full lethal potential of WMD, essentially, all of these elements would have to cooperate to a high degree to conceive, plan, prepare, and execute such attacks. There are important barriers to their success in doing so as this chart suggests.

This line of investigation casts doubt on the conventional wisdom that "we know that terrorists are motivated to use WMD." In fact, we can imagine a range of intentions, from simply exploring the possibility of acquiring or using WMD, through the intention to create such weapons and threaten their use, and up to an intent to reap their full lethal potential. In historical experience, only a relatively few groups have formed the first of these intentions; and far fewer have developed the higher-end ones. This fact is represented in Figure 3. Only Aum Shinrikyo has so far been committed—and evidently not deeply committed because it was not successful in reaping the full lethal potential of WMD. That should be encouraging to us.



To reap full lethal potential	**Aum?**
To kill larger numbers than before	**Al Qaeda**
To kill in the usual way	**Any? WMD "competes."**
To harass	**Any?**
To threaten	**Historically, more than actually have.**
To have	**Very few.**
To spoof	**Occasionally—mostly individuals.**
To explore the possibility	***Relatively* very few groups**

Figure 3 "We Know Their Intentions," Really?

Rogue States and WMD

What about state actors? Why have not state adversaries so far resorted to the use of WMD in the decades since the end of the Cold War? Especially in U.S. wars of regime removal, why have they not threatened or used such weapons to safeguard the regime's grip on power?

A variety of opinions has formed in answer to these questions, just as they did in answer to the question about why terrorists have not used WMD. These include the following hypotheses:

1. ***Deterrence.*** In only two cases was regime survival at risk. In those cases, deterrence worked against political leaders or military decision-makers at various levels.

2. ***Preemptive Operations.*** In the two Iraq wars, early, decisive operations denied adversaries the operational ability to employ WMD.

3. ***Passive Defenses.*** Effective passive defenses took adversary cheap CBW shots off the table and left them operational options that would have been catastrophic for their interests.

4. ***Conflict Maturity.*** The U.S. did not reach the phase of conflict for which state adversaries prepared and deployed WMD.

5. ***Low-Key Methods.*** Weaker states can beat the U.S. without recourse to highly risky means. Asymmetric conflict against the U.S. involves fighting in ways that do not legitimize the full use of the force available to it. Use of WMD would unleash full U.S. power.

6. ***Avoidance of High-Risk Tactics.*** Terrorist delivery means may seem appealing but are too risky for leaders who doubt their grip on power.

Obviously, some of these ideas are contradictory. Each seems to have been embraced without a great deal of detailed analysis.

In exploring the possible incentives of non-state actors to acquire and employ WMD, we began with Brian Jenkins' famous characterization of their purposes. What are the analogous purposes of state actors? Especially when they face the possibility of war against a far militarily superior United States, what incentives and interests shape their strategic choices? In my view, such state actors have a series of strategic priorities in such a circumstance. I summarize these below as a series of imperatives. These are to:

1. ***Dissuade.*** Dissuade formation of a coalition under U.S. leadership and thereby isolate the U.S. in the hope that this will be militarily or politically crippling to U.S. power projection.

2. ***Deter.*** If Imperative 1 fails, deter the coalition from taking military action and thereby secure the aggression.

3. ***Achieve fait accompli.*** If Imperative 2 fails, achieve a militarily decisive fait accompli prior to outside intervention, reversible only at high cost to the intervening parties.

4. ***Cripple.*** If Imperative 3 fails, cripple the intervention in its early phases to prevent the coalition from exploiting its full military potential, thus creating a prolonged stalemate and a basis upon which to negotiate an outcome that protects some or all of the aggression's gains—or at least regime survival.

5. ***Defeat Conventionally.*** If Imperative 4 fails, inflict operational defeat on in-theater coalition forces by conventional means alone.

6. ***Survive.*** If Imperative 5 fails, prevent a battlefield defeat from becoming a strategic defeat that might include dismemberment of its military, occupation of its country, and/or removal of the aggressor regime—and do so without legitimizing a nuclear reply.

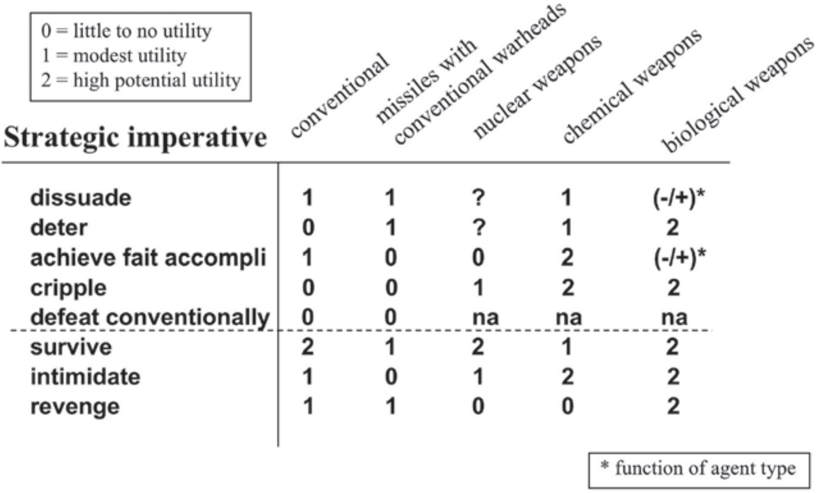
7. ***Intimidate.*** If the original aggression is reversed, the military is hobbled, the country loses some measure of sovereignty, but the regime escapes

the war intact, the imperative is to prevent a consolidation of regional forces detrimental to its interests.

8. ***Exact Revenge.*** Exact revenge against those who fought against it—whether individuals, groups, or societies. A weak, collapsing regime might be particularly motivated to exact such revenge. (An imperative?)

Obviously, this is a rough sketch and not applicable in every respect vis-à-vis every potential U.S. asymmetric adversary. But it is a useful way to think about how they think about the problems of confrontation with the United States. Where does WMD fit in achieving these objectives?

In service of these imperatives, asymmetric state adversaries of the United States have a somewhat diverse toolkit. These tools are represented across the top of Figure 4. The remaining content of the figure constitutes my best effort to assess, from the state adversary's perspective, the utility of each of these tools in service of the varied imperatives repeated again down the left-hand side of the figure.



0 = little to no utility
1 = modest utility
2 = high potential utility

Strategic imperative	conventional	missiles with conventional warheads	nuclear weapons	chemical weapons	biological weapons
dissuade	1	1	?	1	(-/+)*
deter	0	1	?	1	2
achieve fait accompli	1	0	0	2	(-/+)*
cripple	0	0	1	2	2
defeat conventionally	0	0	na	na	na
survive	2	1	2	1	2
intimidate	1	0	1	2	2
revenge	1	1	0	0	2

* function of agent type

Figure 4 Weighting the Tools in the Adversary's Toolkit

Of course, specific ratings in Figure 4 are arguable. But they do point to some interesting insights. Biological weapons might be highly rated by potential state adversaries because they provide high potential utility across a broad spectrum of imperatives, particularly if nonlethal types could be used early in a conflict. As the question marks indicate, much ambiguity exists about the utility of nuclear weapons for state adversaries.

> *"We have seen very few activities by jihadists that are not in the playbooks used in the training programs in the camps in Afghanistan. The lack of competency and ability to innovate amongst the rank and file is not what we expected, and it seems that it is not what the leadership of al Qaeda expected."*

Alternative Hypotheses

So how do we understand the dog that has not so far barked? Recall the opening hypothesis, expressed as current conventional wisdom: "It's not a matter of if but when." In light of the preceding discussion, let us consider some alternative hypotheses:

1. Terrorist interest in CBRNE is rising, but how far and how fast are uncertain.

2. Terrorist intentions to exploit the full lethal potential of WMD are not well demonstrated.

3. The intentions of rogue state leaders to threaten or employ WMD are unclear.

4. Although the intent to use WMD may be secret or merely uncertain, we can infer a partial picture of the intentions adversaries might have in a conflict by understanding those conflicts from their perspective.

Are dogs that do not bark permitted in our vision of the future of warfare? Is adversary restraint consistent with the understanding of unrestricted warfare? I found it useful to return to the Chinese godfathers of unrestricted warfare: Qiao Liang and Wang Xiangsui. As they argue in their famous book, "the concept of exceeding limits . . . does not mean that the most extreme means must be selected always and everywhere." So far at least, U.S. adversaries have not seen it as necessary or possible or wise to select the extreme means of WMD to advance or safeguard their interests in war against the United States. Of course, this cannot disprove the notion that "it's not a matter of if but when." What it does is raise a fundamental question about how well we understand our adversaries' concepts of war against us.

- **"The concept of exceeding limits . . . does not mean that the most extreme means must be selected always and everywhere."**
- **"The trend is toward unrestricted employment of measures but restricted to the accomplishment of limited objectives."**
- **"Victory is certainly not in the bag just because a side adheres to the principles [of warfare in an age of globalization], but violating them no doubt leads to defeat."**
- **On nuclear weapons: "How do we avoid warfare that results in ruin for all?"**

Figure 5 Conan Doyle Meets Qiao Liang and Wang Xiangsui: Is WMD Restraint Inconsistent with the Theory of Unrestricted Warfare?

2.4 THE JIHADIST THREAT

Mary Habeck

INTRODUCTION

To develop an effective strategic policy and an understanding of the nature of URW, it is paramount to have a keen awareness of what radical jihadis think and say about weapons of mass destruction (WMD) and how these differ from traditional Islamic beliefs on the use of these weapons. Jihadist statements reveal that their interest and intention levels towards WMD are shifting away from traditional Islamic thought over the past 6 years. These statements cannot be taken at face value, because, obviously, they are not telling us everything they can do with regard to capabilities; but their interest and intent are quite clear and represent a significant threat.

To illustrate the change in jihadist thinking on this issue, let us begin with three statements made by al Qaeda and affiliated groups over the last 5 years about WMD. In November 2001, almost precisely 2 months after the attacks of September 11, bin Laden gave an interview with a Pakistani journalist in which he discussed the current struggle in Afghanistan. His views about WMD came up in the course of this conversation. He said, "I wish to declare that if America used chemical or nuclear weapons against us, that we may retort with chemical or nuclear weapons.

Mary Habeck is an Associate Professor of Strategic Studies in the Paul H. Nitze School of Advanced International Studies at The Johns Hopkins University, where she teaches strategic and military history. Her latest work is Knowing the Enemy—Jihadist Ideology in the War on Terror. She is currently working on a second book entitled Fighting the Enemy.

We have the weapons as a deterrent." This is a strong statement about possession and about capability, but it is also a statement about intention—to use WMD only if al Qaeda was attacked first. It is important to note that bin Laden apparently viewed WMD as a deterrent and not as a first-strike capability.

In contrast, Ansar al-Islam made a statement in April 2004 that was quite different. "We will strike you with all the weapons available to us," the statement read, "including conventional, chemical, nuclear and biological weapons. You will see blacker days than the 11th September incidents." This is a much stronger statement about interest and intentions, "We *will* use these weapons against you;" and conventional weapons are placed on the same level as nuclear, chemical, and biological weapons.

The third statement was made by Abu Hamza al-Muhajir, the leader of al Qaeda in Iraq, last September 2006. In this statement, al-Muhajir gave an open invitation to scientists of chemistry, physics, management, electronics, media, and all other specializations that require depth of knowledge and, particularly, nuclear scientists and explosives engineers. As he put it: "We call on you to tell you that we are in need of you. The battlefield will accommodate your scientific aspirations. The vast areas in the American camps will be the best test site for your unconventional bombs—especially the so-called germ or dirty variety."

"[Osama bin Laden] said, "I wish to declare that if America used chemical or nuclear weapons against us, that we may retort with chemical or nuclear weapons. We have the weapons as a deterrent."

This is again, a very strong statement about intentions and interests, but the capabilities are a little shakier. In fact, this last statement suggested that the capabilities were not yet where al Qaeda and affiliated groups would like them to be, but that their interests and intentions have shifted significantly over the past 5 years. This paper will focus on that shift and what has caused it.

We need to begin with where WMD fits into traditional Islamic thinking about warfare and then discuss jihadist beliefs about the legal, religious, and ethical barriers to the use of WMD and what has transpired to allow them to surmount these barriers. What is the historical Islamic thinking about WMD? Muslims have thought deeply about mass destruction over the past 1400 years. Of course, the definition of WMD has shifted considerably in that timeframe. WMD, back when Muhammad was alive, meant a catapult, a weapon that would indiscriminately kill civilians, combatants, and non-combatants alike. It did not discriminate amongst its victims, and it killed large numbers of people—a primitive WMD.

"We call on you to tell you that we are in need of you. The battlefield will accommodate your scientific aspirations. The vast areas in the American camps will be the best test site for your unconventional bombs especially the so-called germ or dirty variety." —Abu Hamza al-Muhajir

During the time of Muhammad and shortly thereafter, four sorts of prohibitions were developed to limit the use of these kinds of weapons: the need to avoid mass casualties, the indiscriminate deaths of non-combatants, the deaths of Muslims who happened to be living in the town that was bombarded, and burning people alive. When most Muslim scholars looked at these four barriers, they came to the conclusion that they were nearly insurmountable. The prohibitions could be overcome only if certain very stringent conditions were met: the weapons had to be absolutely necessary, and no other sort of weapon could be used in their place. In modern terms, Islamic law created a "last use" vision for WMD. They were not to be employed indiscriminately, and an argument had to be made for them rather than against them.

To show just how high these barriers are, let us take a closer look at three of them: the need to avoid killing non-combatants and Muslims and the prohibition on using fire to burn people alive. The distinction between combatants and non-combatants is extremely important for understanding Islamic attitudes toward WMD because combatants, whether or not they had a weapon, could be killed; whereas non-combatants were to be left entirely alone. Each one of the four established schools of Islamic law argued very strenuously for making and keeping to this distinction, based on Muhammad's words and deeds. The schools also had arguments about attacking a town where Muslims were being used as human shields. Could you attack the town, or should you hold off lest you accidentally kill a Muslim? About half the schools said, "This is a good reason not to attack the town. If Muslims are going to be killed or endangered by our attack, we should find some other way of dealing with this town other than using the catapult or other weapons that kill indiscriminately."

The other two schools said, "If we do that, we would never carry out jihad because people would learn about this weakness; and they would simply use Muslims as human shields." Yet, even these two schools said that this did not allow the use of indiscriminate weapons when Muslims were present in the town. Finally, burning people alive was strictly forbidden by Islamic law because burning was considered God's punishment. Islamic scholars even raised arguments about trees and the environment, with half the schools saying that it was not only wrong to burn people, it was wrong to burn trees or to destroy the environment during a battle.

This is fairly progressive thinking for 1200 years ago. Thus, the cultural and religious barriers to the use of WMD in early Islamic thought were high and remained at that level right into the 20th century. Most Muslims adopted international law and the standards of international law and argued, in fact, that if Muhammad was there first—he would have seen this as a natural progression—and ideas about WMD as understood by international law fit, in this view, perfectly into Islamic law. It is these barriers that jihadis had to deal with when making an argument for the use of WMD.

The stiff barriers to the use of WMD within the Islamic community explain why, before 2004, there were no serious arguments by jihadis about using WMD. Yet, something happened between 2001 and 2004 that would change this attitude. In 2003, Nassir bin Hamad al-Fahd, a radical Saudi sheikh, issued a fatwa (a legal ruling) called, *A Treatise on the Legal Status of Using Weapons of Mass Destruction against Infidels*. In it, al-Fahd carefully analyzed the four major objections that Muslims have traditionally raised to the use of WMD (mass casualties; indiscriminate deaths of non-combatants; deaths of Muslims; and horrific ways of dying, including being burned alive), explained away each one in detail, and then provided a general justification for using these weapons.

> *". . . first, you should chastise even as you have been chastised; second, you should repay evil with evil; and third, who so commits aggression against you, do you commit aggression against him in like manner."*

Al-Fahd begins with a general statement that there is no obligation when there is inability, and there is no prohibited thing when there is necessity. Those two statements are taken directly from Islamic jurisprudence—a very different section of Islamic jurisprudence than that dealing with WMD or even with warfare in general. But he uses them to make an argument that there is an obligation to use WMD—not just permission but an actual obligation—and their use cannot be prohibited because there is a necessity to do so. Al-Fahd then goes on to refute in detail the four taboos. With respect to mass casualties, he argues that there are three different statements in the hadith [traditions about Muhammad] and in the Qur'an saying that mass casualties are justified in this case. First is a statement that you should chastise even as you have been chastised; second, you should repay evil with evil; and third, who so commits aggression against you, do you commit aggression against him in like manner. Al-Fahd argued that America and its allies have caused massive casualties in the Islamic world for which America should be held responsible. In addition, the Americans have killed men, women, and children without discrimination, so that Muslims have the right now to kill without discrimination as well.

But where have Americans been massively killing Muslims indiscriminately? Al-Fahd referred specifically to the sanctions against Iraq imposed after the first Gulf War. According to his reasoning, the U.S. purposely killed Iraqi men, women, and children through these sanctions—indeed, the sanctions were designed to kill Muslims. Not only that, but the U.S. also invaded Somalia solely to inflict massive casualties on Muslims. During the nineties, the U.S. then armed, trained, and helped the Serbs to kill Muslims in Bosnia and elsewhere. It was only when the U.S. was exposed that America pretended to back away and do something about the casualties that were taking place. One might have some disagreement with these three propositions and others that al-Fahd brings up, but they are arguments that resonate in the Islamic world and especially resonate with jihadis, who believe them wholesale.

How then does Al-Fahd get past the prohibition on indiscriminate deaths, especially of non-combatants—women, children, old people, monks and so on? He brings out what might be termed "the catapult defense," which is used by all jihadis when talking about this issue. He also raises the idea of attacking the infidels at night. There are some hadith that tell about Muhammad using a catapult against a city, a weapon that, like WMD, kills indiscriminately. Another hadith reports that in a raid carried out at night, Muhammad accidentally and unintentionally killed non-combatants—women and children. Using analogy, al-Fahd argues that therefore it is permissible to attack the infidels with weapons that do not discriminate between combatants and non-combatants and at a time or place when one cannot distinguish between combatants and non-combatants. It is important to notice that both of the cases raised by al-Fahd have to do with unintentional collateral damage. But al-Fahd argued that collateral damage is not just reluctantly permitted but is, in fact, desirable, which is a seismic shift from traditional Muslim tenets.

In his refutation of the ban on the death of Muslims, al-Fahd cleverly turns the argument into one about intentions rather than results. Recall the human shield argument that was earlier used by the two schools of Islamic law: if we give up on jihad because Muslims are being used as human shields, we will have to give up on jihad entirely. Al-Fahd said that this was actually about intentions: we do not mean to kill Muslims, and they were purposely being used against us as human shields. Thus, our lack of intention to kill them, as well as the bad intentions of our enemies, allows us to carry out massive attacks using WMD that will kill Muslims.

Finally, what about burning the enemy's land, the destruction of the environment, and killing people through burning? Again, a hadith that talks about Muhammad saying nothing against the burning of fruit trees during a siege is used as an argument to justify killing people through burning. Even someone who has had no exposure to Islamic law would say that this is a very bad argument. But immediately after Al-Fahd's treatise appeared in 2003, every single one of these arguments was adopted by jihadis in multiple groups to explain why the use of WMD was allowed.

In all of their writing, there is the repeated appearance of the catapult defense, of the burning of the land defense, of the human shield defense. The result has been a movement away from the use of WMD as a deterrent—if they are used against us, we will use them against the enemy—to their use as soon as jihadis have the capability. From a close analysis of jihadist statements it is possible to say that intentions have shifted, and interest has shifted; but capabilities may not have changed at all.

2.5 QUESTIONS AND ANSWERS HIGHLIGHTS

Transcripts

Q: *Prof. Thomas Keaney – The first question is for our first speaker, Michael O'Hanlon. "Originally, Iraq was denied as a safe haven, and the rationale for invading Iraq was claimed to have been to prevent the use of weapons of mass destruction. An important secondary effect has been that we have kept the fight over there. Please assess the strategic validity of this assertion. And if you disagree, please assess why we may not have been attacked on the U.S. mainland since 9/11."*

Dr. Michael O'Hanlon – Thanks for the question. My overall assessment would be that the Iraq War was undertaken for a sound strategic rationale to reduce Saddam's potential future threat to the region, for a traditional strategic state-on-state sort of reason. It has nonetheless increased the threat of terrorists. We can debate that, if you wish, but I think, on balance, it has provided a huge rallying cry for the Islamic world. Mary talked about the sanctions, and I would concede that was an important argument in favor of considering the invasion in the first place—the previous policy wasn't as good as war opponents seem to want to nostalgically remember today. Nonetheless, I think there was a potential strategic benefit—to getting Saddam and potentially his sons out of power. But there was a net increase in terrorism as a result because of what the war has meant in the broader Islamic world. One additional point complicating it even further is that, given where we are, I think to withdraw would probably make things even worse on the terrorism front. So, the terrorism argument, in other words, is not a good justification for why we went in in the first place; and on balance, the war has made things worse. But they could get even worse if we were to be seen as having been defeated in Iraq by al Qaeda.

Q: *Prof. Thomas Keaney – Specifically, does the threat to the homeland extend beyond weapons of mass destruction—that is, information warfare? Have you done anything specific on that?*

Dr. Michael O'Hanlon – I don't know that I have any huge insight to offer on that. What we see from al Qaeda, as Brad pointed out, is that they have gone back to some of the traditional playbook. I would worry about WMD because of the potential for devastation and because there is debate within the Islamic world and among the jihadists about whether it's legitimate as a tool. But I would still, day to day, worry most about airplanes, truck bombs, and other such traditional uses of explosive or tactics that al Qaeda's been employing for years now.

Q: *Prof. Thomas Keaney – Here's a specific question for Brad Roberts. It's about what Mary talked about and you captured in terms of intentions and capabilities. "Why haven't the jihadis attacked us?' Mary's point is that starting around 2003/2004, there was a change, which explains the lack of data you mentioned earlier. Did you see the same change around the same time that could affect the intentions and capabilities?*

Dr. Brad Roberts – That's a great question. That would be the striking contrast between our two presentations. Listening to Mary and reading her work, I'm reminded of General Cartwright's proposition about how different the adversaries are and the world we're moving into. They are not organized, they are not hierarchical—although they have organized and have hierarchical attributes. But since this particularly important fatwa was issued, we've seen bombs under chlorine canisters; and undoubtedly, there are other development activities going on. We have a gauge from Afghanistan in terms of understanding how al Qaeda leadership takes responsibility for certain high-priority activities—it creates compartmented R&D, black programs, funds them lushly, and sends those people off to go to work.

Yet, their bio program had those attributes; and they had a response to a posting on the web to come and bring us your expertise—we need you. All of that happened, and yet no capability resulted even after some time. In contrast, Saddam made the decision for bio and went from beginning to a deployed capability in 3 years and had a development activity under way that would've brought a lot more. This adversary doesn't make that kind of top-down decision to put the pieces in place, make it go happen. It counts on jihadi fervor to make these moral legitimizing statements become operationally real somehow. General Cartwright rightly emphasized the rapid decision-making loop of these new adversaries, but their operational loop of going from an ambition in one part of the network to knitting together all of the pieces to implement it—and not just in ones and twos but in a campaign of attacks—that is a capacity they don't seem to have or at least have not so far developed.

Q: *Prof. Thomas Keaney – I've got several questions from the audience. Let me take one out of order because it applies to just this issue, and it is also for Mary Habeck. "It seems that Islamic culture is more adaptable to unrestricted warfare as evidenced by its willingness to reverse the previously held beliefs. Western culture, on the other hand, has carefully restricted the use of violence and created legal, moral, and cultural barriers to unrestricted warfare that seem insurmountable. Can western civilization adapt rapidly enough to survive the unrestricted attacks we may face? Can we overturn our beliefs and laws as rapidly as this fatwa did?"*

Dr. Michael O'Hanlon – I guess I should've been clearer at the beginning that what I'm talking about here is a very small percentage of the Islamic world. I think that the reason—besides capabilities—there has been no use of WMD so far is an uncertainty about how the rest of the Islamic world would react to such an attack. I don't make any argument at all that the jihadis are representative of the Islamic community; and in fact, many different clerics have issued fatwas saying that WMD are not Islamic, are not something that should be used, or are just for anybody to create and use. I didn't talk about that because the focus here is obviously on the jihadis, but there are still huge barriers for these guys to overcome within the Islamic world itself. Even though I think that some portion of the jihadi community believes that WMD are perfectly fine, and that portion is associated with what is generally called the Salafia Jihadia, that is, the Wahabi-influenced Jihadis. They're the ones who are most likely to have these intentions to use WMD and have the interest in using WMD. Even within the jihadist community, it's not as if all of them have put out statements saying: WMD are fine, and we believe in using them. Unfortunately, al Qaeda and affiliated groups are members of this Salafia Jihadia and follow along in its ideological footsteps. This particular sheikh Nasir bin Hamad Al-Fahd is well respected by al Qaeda's leadership and is seen as somebody whose thoughts should be followed. So, I'm really not making an argument about the greater Islamic community and where it is on this issue.

Q: *Prof. Thomas Keaney – Mary, the next question asks you to extend that just a bit. "How worried should we be about Muslim attempts here in the United States to not assimilate with the infidels in American culture—that is taxi drivers refusing service to passengers carrying alcohol, et cetera. How far should we allow the envelope to be pushed?"*

Prof. Mary Habeck – One of the arguments that I generally make about why we've had no attacks in the United States is that Muslims in our country are pretty well assimilated and are generally on the far liberal moderate mainstream edge of the Islamic world. In other words, they're the farthest away from the Wahabi Salafia Jihadia. They're not the kind of people who accept this sort of thing at all. So, I don't actually see that there's a huge problem with lack of assimilation in this country and certainly not on the scale that you have in places like France or Britain. You also don't have the secondary issue that has developed in Britain, where 10 to 20 of the top jihadist preachers in the world were allowed into the country and welcomed for about 15 years; and they spent the entire time building up a following of several thousand people. There are several reasons we've been protected from attacks here. It may have to do with capability; but mostly, it's because of lack of desire. Muslims here see themselves as Americans.

Q: *Prof. Thomas Keaney – For this question, let me start with Brad since he's addressed several of these aspects and then continue with Michael. "Based on the whole term 'weapons of mass destruction,'* *we neatly categorize a number of things—chemical, biological, nuclear weapons, delivery vehicles—which are clearly not the same." I'll first ask Brad to parse those into what we should really be worried about: chemical, biological, and nuclear in different issues or different situations. And specifically for Michael, when he talked about the Asia Pacific region, "Should we consider that some of these weapons—for example, chemical weapons—may be used more routinely and not in the sort of catastrophic way that we sometimes think they would be?"*

Dr. Brad Roberts – N versus B versus C, as most of you know. Most of you have the view that C doesn't really count much. Chemical weapons aren't really weapons of mass destruction; and that's pretty much true against a large conventional force with very strong passive defense capabilities. But these are weapons that can be used readily, particularly in closed environments, and delivered by aerosol from very simple delivery devices, including Cesnas, to create large effects on unprotected populations. So, I think we do ourselves a disservice to write off the CW piece. On nuclear, I'm not sure what to add to our understanding of that—we've all done a lot of thinking about that.

The bio piece is one where I think people have a hard time calibrating how big a deal it is. The expert community is roughly divided into two camps that don't at all agree. Either it's a really big deal, and the sky's going to fall; or it's been hyped for so long, and it hasn't happened so there's nothing to this threat. As my slides suggested, biological weapons are particularly appealing to states facing the necessity of an asymmetric conflict against the United States in which they don't want to use nuclear weapons. Using a nuclear weapon against the U.S. in a military conflict is a pretty stupid thing to do. An enemy using a nonlethal bio weapon to create a potential fait accompli while we're engaged in some main military operation could be potentially highly crippling to our activities, as would the use of lethal bio. I want to come back to a point about the fatwa on WMD, which is that it established a number. It's morally legitimate to kill—was it 4.2?

Prof. Mary Habeck – Ten million.

Dr. Brad Roberts – Ten million. Ten million. This is germane not to an al Qaeda calculation of the use of chemical weapons, and, frankly, not to an al Qaeda calculation of the use of nuclear weapons. Killing 10 million people with crude fission-style improvised nuclear devices is hard if you're building them in a cave somewhere. Bio is probably the way to go for 10 million—and let me be crude about this: If you're familiar with the CSIS [Center for Strategic and International Studies] Dark Winter scenarios, I find 10 million reassuring. Bio with a crude pathogenic—smallpox, for example—could kill in the multiple tens of millions. This is the distinction between weapons of mass destruction and the full lethal potential of a weapon of mass destruction. If there's a moral barrier between killing 10 million and 50 million or 100 million, I'm happy to celebrate its existence even if it is deeply troubling on its own.

Q: *Prof. Thomas Keaney – Briefly, Mary and then Michael.*

Prof. Mary Habeck – The 10 million figure is based on his calculation of how many Muslims have been killed by Americans in the last 40 years. But, he says, if you need to kill more than 10 million, just come back for another fatwa.

Q: *Prof. Thomas Keaney – Michael, the conventional use of these weapons.*

Dr. Michael O'Hanlon – I'm just going to throw out one scenario. I've already apologized to any Russians and Chinese in the crowd, and I'm going to apologize to Japanese. There are a lot of ways in which WMD could plausibly be threatened or used in Asia Pacific theaters; but, for the sake of simplicity, I'm just going to mention two that I think are not out of the question, and they both potentially involve nuclear weapons. To some extent, the unifying theme here is the dislike of many in the region for the Japanese and perhaps the willingness to think of American bases in Japan as a legitimate military target. You combine all that together, and I could see ways in which the North Koreans, while they might not want to use nuclear weapons against South Korea, and they might not be able to use them against the American homeland or see the value of engaging us, might say, in the context of an ongoing war: "Why not hit the Japanese?" The South Koreans might not even mind that much. The North Koreans might convince themselves of this logic. Then, they may also say: "The Americans need military bases there enough that if we hit some of those bases, we'll kill a few hundred Americans, but that's a legitimate number in a time of war. And if we kill a million Japanese who live next to that base, we can put up with that because we have this historical animosity, and they've killed so many of us." The proportionality argument of the type that Mary was just mentioning regarding the western world and Muslims could come into play there in terms of how the North Koreans or for that matter, the Chinese, think about retribution against Japan.

Moving now to China, in a Taiwan Strait scenario, let's say we get to the point where the United States has decided to sink the Chinese submarine fleet as comprehensively as we can because we've decided that's the main threat to Taiwan's economy. If the Chinese really want to go air-to-air with us, we can always escalate or match them as needed. But the submarine threat is one we want to eliminate at a certain point in this conflict. Then, the Chinese could say: "At this point in the conventional competition, we're out of luck; but what about a nuclear weapon against facilities in Okinawa, for example, or for that matter, Yokosuka?" All of a sudden, there could be an escalation of that type, where they argue that it's against a military target. Of course, the people they're killing are Japanese with whom they have a historical animosity and owe payback. I would worry about a North Korean or a Chinese mind constructing that sort of an argument. That's one very particular answer to your question, Tom.

Q: *Prof. Thomas Keaney – A quick one for Brad. "What do you make of the chemical weapons, the chlorine gas that is being used in Iraq? Do you see that as some sort of opening of the door? Is it something to be really concerned about?"*

Dr. Brad Roberts – It reinforces the experience the terrorists had in their first forays in this area; they crossed what we thought was a significant threshold, and they haven't gotten much for it. There's the more famous case of the LTTE [Liberation Tigers of

Tamil Eelam] in Sri Lanka using chlorine gas to attack a military base in 1991 or '92. They never used it again. It didn't work very well for them, and they had other techniques that have worked better. It seems to me that these attacks have not succeeded in inflicting significantly different numbers of casualties or inducing any other reaction from the targeted society than they were already getting.

Q: *Prof. Thomas Keaney – A question for Brad or Mary on biological weapons or biological issues: "What's the likelihood that the recent pet food problem may be a testing or training exercise for a chemical or a biological attack factor? "*

Dr. Brad Roberts – I've been in the U.K. for the last 10 days, and my *USA Today* this morning said, "Pet Food Scare," and that's all I know about the subject. May I make a footnote comment? If you're trying to understand the bio threat, I recommend a piece on the web by Seth Carus at National Defense University, entitled *Bioterrorism and Biocrimes*[1]. He's at the Center for the Study of WMD, and he set out 10 years ago to compile a list of all of the incidents in the 20th century in which a biologic agent was used for some illicit purpose. He issued a first edition in 1996 and then got a whole bunch of phone calls telling him, "You missed this, you missed that, you never heard…" Now, there are five editions; there's a sixth coming out; and the list is long. What's striking is that criminals have been much more interested in the use of biologic materials for extortion than have terrorists, and assassins have been much more interested in the use of these materials than state structures. This is a very striking pattern drawn from a very large dataset. I'm completely ignorant about the pet food business; but if there's any tampering involved here, it's not consistent with our expectations about the terrorists' level of interest in this.

Q: *Here's a question that really takes us in a new direction, open to anyone who wants to address it. "Michael O'Hanlon focused on traditional strategic warfare options—diplomatic, economic, and military. Dr. Roberts focused on weapons of mass destruction. Why aren't we talking*

[1] W. Seth Carus, *Bioterrorism and Biocrimes: The Illicit Use of Biological Agents Since 1900*, National Defense University, Center for Counterproliferation Research, Fedonia Books, 2002.

about the elephant in the tent—strategic communications? In the current war, our enemies are exploiting our political and cultural differences to defeat us." Strategic communications seem to pair with another question: "Do we place the burden of responsibility on the press and the infotainment focus business that exploits the relatively small numbers of Islamic trash or fails to report on Muslims that are devoted to pluralistic democracy, as those are who are culturally western. In other words, what about strategic communications—are strategic communications exploiting both what the Islamics are doing and what they are trying to do to us?"

Dr. Michael O'Hanlon – Big topic. I'll just say a word and pass the baton. There's a very good paper being done at Brookings that is going to be on a new website we're creating called Opportunity08.org, focused on the presidential race. Peter Singer and a colleague in the Brookings Doha Qatar Office have recently proposed a strategic communications strategy. I was very frustrated that the 2004 presidential race didn't address this issue. George Bush, to be fair, had a part of it. Democracy promotion was intended to be part of the answer; unfortunately, it hasn't had a very good 3 years since then. But it was still an attempt to engage this question of the long-term threat, the strategic communications threat, although maybe not in quite the way the questioner meant.

This is a huge topic and can be interpreted in many different ways. I'll finish with an anecdote. I was lucky enough to see Senator Bill Bradley last week at a conference, and I asked him, "How much do you regret not having been President on 9/11 or after 9/11?" He gave an extremely eloquent answer about all the different things that might've been done. One of them was to convene a meeting of western and Islamic religious leaders and ask them for advice about conveying to Muslim and western secular political leaders what steps might be taken to try to bridge some of these divides. We've been taking some smaller steps, such as increasing the number of American centers around the world, putting more money into broadcasting, etc. But I think we have to be even more creative and find ways to actually get Islamic and western communications going.

I was just at a conference that Brookings Sabon Center does every year, which tries to do a little bit of what Bradley was talking about and ask people to criticize one another. At the end, it tries to find a more constructive set of messages about how we can exchange our different views on history, try to share the better side of one another's cultures, make sure some of the ignorance is broken down, and find new tools—Internet and other tools—for spreading information about one another's cultures. As Mary said, "So many American Muslims are such wonderful people who are so involved in our society, and it's really something we should be celebrating even more and underscoring that our society is a melting pot that's intended to respect diversity."

I just hope that, in this next presidential race, we see both sides willing to engage this question of how to prevent the second-generation al Qaeda from forming—to answer the old Rumsfeld challenge—instead of just focusing on the more narrow, immediate problem of what to do in Iraq.

Dr. Brad Roberts – I, too, would like to weigh in. People use the word strategic communications, and I think everybody has a different elephant in mind. What's so obvious to one isn't so obvious to another. I find it useful to think of two elephants: the external elephant and the internal elephant. The external elephant is the external audience to which the U.S. communicates, and we are hyper worried about the messages sent there, in part, because of the tradition in our own culture of the central role that strategic communications played in deterrence in the Cold War.

I think we vastly overestimate our ability to get the right messages out to external audiences to induce the behaviors we desire. The basic punch line there is like the Hippocratic Oath: First, do no harm and don't expect to do much better. That would be doing a lot. The internal elephant hardly features in our discussion of strategic communications. Al Qaeda's very clear about the importance of our public will.

I believe there are many more opportunities for the national leadership to excel at the business of strategic communications to the American public. If al Qaeda perceives that it can break our will by getting us to disagree about how to prosecute a long war here, we will have played right into its hands. We won't create long-term will by doing what one of the questioners implied earlier, which is moving away from moral constraint as we understand it. We have to see our actions as just in our own traditions. This is much more important than that the Arabs see our actions as just in their traditions. Very little work has been done in laying this foundation for continued consensus.

Prof. Mary Habeck – I'd just like to make three quick points. First of all, this is an issue I've been thinking about a lot for the last 6 years; and in 2004, I actually applied for a job in the NSC. It was creating a new position on ideological warfare. It hired somebody else for the job, but I had a conversation at that time with Elliot Abrams and asked him, "Why wasn't this done earlier?" He said, "We attempted to do it but ran into all sorts of issues with both DoD and State, and nobody could decide what in the world they were trying to do." Since then, as we know, there have been positions created at both of these institutions to deal with this issue. The problem I see is that there've been multiple positions created, and nobody's talking to each other. Everybody has their own in-house IO, and it's as if they're reinventing the wheel. "Look, here's fire. Oh, they have fire, too—didn't even know this." It's all over the place and nobody even knows what's being done. That's the real problem. Everybody says: "We need to do something about it." But there are actually other people doing it. That's the first point.

The second point is that we face a huge barrier to dealing with this issue that nobody is confronting head on: How do we deal with religion? How do we deal with religion as non-Muslims? How do we communicate with people who do not come from our religious tradition? The analogy that I like to use is: I believe that the Islamic world is involved in its own reformation. We forget that the European reformation began with 150 to 200 years of bloodshed; and it was only after everybody got sick and tired of killing one another that they sat down and talked and came up with the enlightenment. So, what we're dealing with here is maybe 150 to 200 years of bloodshed, and it's really mostly about an internal dynamic about authenticity: What is real Islam going to look like? What do we have to say about that? We'd be like the Ottoman Sultan coming to the Pope and saying, "What can I do about your Luther problem?" How much help would that be to the Pope? This is a huge issue, and I don't see anybody dealing with it in any really sophisticated way. We shy away from it. This is why I think we have a strategic communications problem at base. And, if that's true, we really need to find partners within the Islamic world to do the talking for us. But who are our partners? We don't have a real touch and feel to understand peoples' position within their own society.

Let me give you the problem from al Qaeda's perspective. It has a huge communications problem as well. It has had all sorts of stumbles all along the way; we should be encouraged that we're not the only ones who are having this problem. It had two problems. First, bin Laden decided to put out a major statement to influence the 2004 elections. He said, "Anyone who votes for Kerry will not be attacked. Any state that votes for Kerry will not be attacked." We saw how successful that was in getting people to vote for Kerry. As a strategic communications attempt, it was an abysmal failure. Not as bad, by the way, as the [UK] *Guardian*'s attempt to influence the election in Ohio.

"The problem I see is that there've been multiple positions created and nobody's talking to each other. Everybody has their own in-house IO, and it's as if they're reinventing the wheel. "Look, here's fire. Oh, they have fire, too—didn't even know this." It's all over the place, and nobody even knows what's being done."

As for their second problem, the American advisor who is giving them the inside story on what Americans are like and how to reach out to them is a goat herder from southern California. How representative is he of general American opinion, and how well has he done in helping them influence events? I often think our partners [in Iraq] might be the equivalent of goat herders from southern California, but we say they must know more than we do because they're real Iraqis; they're genuine Yemenis.

Q: *Prof. Thomas Keaney – Staying on the issue of strategic communications: "The discussion is focused on nuclear, biological, or chemical. Do you think that jihadists have the capability to attack our critical infrastructure through cyber warfare, or is this too sophisticated for them?"*

Prof. Thomas Keaney – I'm not that worried because our cyber systems are constantly under attack by hackers. I think American and Chinese hackers are probably going to be better than jihadist deliberate saboteurs.

Prof. Mary Habeck – I would say this is probably where they have the highest capabilities because they actually spend a lot of time on the Internet doing pretty sophisticated things with it.

Q: *Prof. Thomas Keaney – Here's a question to everyone: "Are we focusing too specifically on terrorists as non-state actors using unrestricted warfare tactics? What's the plausibility it's being directed by nation states? For instance, Hezbollah led the response following the U.S.-led strike into Iran."*

Dr. Michael O'Hanlon – If we were fighting Iran, I certainly would worry about how well it would use Hezbollah. You'd have to assume that they would both be all-out agents of reprisal. In fact, this eventuality is fairly well appreciated within the government, which is partly why people are so anti-Iran; and also why they're wary about launching a strike—it cuts both ways. I think you'd have to assume Hezbollah would fully support this kind of operation.

Q: *Prof. Thomas Keaney – Another question: "Why are Islamic extremists attacking the U.S.? Are there root causes we can engage versus attacking symptoms? Some of those causes might be economic, cultural, Israel presence, etc. Why are they attacking us?"*

Prof. Mary Habeck – That's an entire book. I wrote my first book to explain why those attacks were carried out. The original title for it was *Why They Did It*[2]. But it's on a very different level than what somebody like Mark Sageman is talking about. There are levels of motivation. At the very top level are the people who are creating the dream that attracts Muslims. That's what the book was about—the dream they're trying to attract Muslims to and their ideas about what they'd like to do. At the bottom, you have ordinary Muslims who might find this attractive. Why they find it attractive and end up becoming radicalized is a completely different question, and something that Mark Sageman deals with. So, there are actually levels and layers of motivation here that have to be addressed. At the top level, you're dealing with people who are like the Bolsheviks: you're not going to convince Lenin that capitalism is a good idea. I don't know what we can do with those people other than kill or capture them. For the other 99.99% of the Islamic world, there are all sorts of things we could be doing to make those ideas less attractive and to create a better environment in their societies that will keep them from being attracted to these ideas. Economic issues, political issues—those are what need to be addressed.

Q: *Prof. Thomas Keaney – A specific question for Michael: "The National Intelligence Council's 2020 vision[3] described scenarios for alternative futures: Pax Americana, Davos World, etc. How would you apply those to your look at the various plausible future scenarios? You were talking about plausibility, not necessarily likelihood. How do you match one with the other?"*

Dr. Michael O'Hanlon – If I understand the question correctly, I'm glad that you summarized with those two scenarios because those are the two that have to be increasingly merged over time. In other words, there is no basis for international stability now absent a strong United States, and that's going to be true for the foreseeable future. But it's also probably not totally sustainable because of what Mary was talking about—we're the focus of

[2] Mary R. Habeck, *Knowing the Enemy: Jihadist Ideology and the War on Terror*, Yale University Press, New Haven, 2006, "Why They Did It," Chapter 1: http://yalepress.yale.edu/yupbooks/excerpts/habeck_knowing.pdf

[3] "Mapping the Global Future: Report of the National Intelligence Council's 2020 Project," NIC 2004-13, December 2004, http://www.dni.gov/nic/NIC_globaltrend2020.html

hatred and of many peoples' desire to challenge us and the whole system. In addition, Americans don't have the desire to bear the whole burden, and we don't necessarily do very well in every scenario.

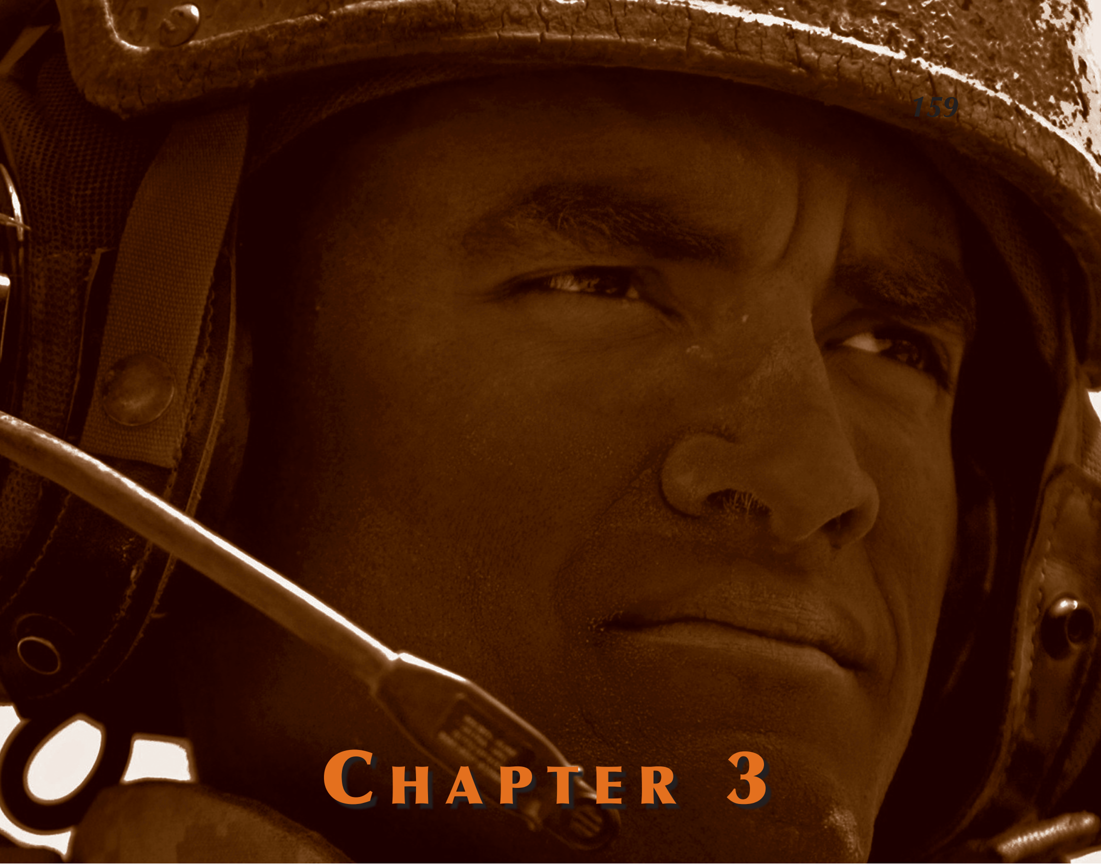
So we've got to evolve—maybe not towards a complete Davos World, which is a little utopian—but towards a more multilateral world, where some of our allies play a little greater role and where we increasingly integrate India and hopefully China into this system. The United States has to retain hegemony at some level but not a classic hegemony—there has to be increasingly more power sharing. There has to be a vision. The real issue is how do you get there? I'll leave that for the next panel.

Q: *Prof. Thomas Keaney – Let me pose a couple of quick final questions. First, for Mary: "How do you explain the constant murderous Sunni–Shiite split in view of the Islamic barrier to killing?"*

Prof. Mary Habeck – Throughout the 1400 years of Islamic history, the Sunni–Shia split has been absolutely fundamental to Islam. It began right at the foundation of Islam and is built in. It stems from a political question of who is going to succeed Mohammed as the leader of the community. The result was that the Shia were an oppressed minority for most of their existence; and the Sunnis were the oppressing majority for most of their existence, which is certainly true in Iraq. The view that each has of the other, though, is quite different. Sunnis generally believe that the Shia are at least sinners and heretics if not outright unbelievers and apostates. The Shia believe that the Sunnis are wrong—fundamentally wrong—but they're not heretics. In other words, the way that Iran reaches out to the rest of the Sunni world shows that a fundamentalist—or what would be called Salafi Shia—vision of Islam includes the rest of the Islamic community. But the way that the Wahabis view the Shia is that Islam includes us, and the Shia are all dead or converted. This fundamental asymmetry explains why the Sunnis have no trouble killing Shia, but the Shia were only provoked into killing the Sunni after years of death.

Also in Iraq, the majority of the Sunnis believe that Iraq is a majority Sunni country, that the Shia are a minority; and anyway, they're all Persians. They also have a saying in Iraqi Arabic—it rhymes—which is: "To us the government, and to you self-flagellation." This explains their vision of our proper places in the universe and also the disdain they have for the Shia in general, which allowed them to permit the kind of killing that's gone on there.

Q: *Prof. Thomas Keaney – We're out of time, but some of the remaining questions address very good strategic issues. For instance: "Is the United States ready to engage in nuclear warfare over the Taiwan issue?" Or more particular issues: "Is the U.S. ready to lose a war? Is the U.S. ready to lose a war based on perhaps the use of these weapons?" We can't answer very many of these, but I think they should be addressed. In contrast to what we did last year, the objective of this panel was to address much more of the strategic issues. If you recall, last year, a good bit of the first day was spent talking about improvised explosive devices.*



Chapter 3

STRATEGIC POLICY ROUNDTABLE

Tailored Deterrence: What Will It Look Like?

3.1 TAILORED DETERRENCE: WHAT WILL IT LOOK LIKE?

Thomas McNamara, Jr.

INTRODUCTION

Throughout the conference, we have heard the word deterrence mentioned consistently. Earlier today, Professor Hoffman spoke of the importance of knowing the enemy and the importance of strategic communications. Those two concepts play an integral role in developing tailored deterrence, our topic for this session.

By way of introduction, I would like to highlight several salient events related to deterrence (Figure 1). Taking a look at the Cold War, the records show that our deterrence posture was not established quickly but rather took many years of refinement to move into a deterrence state that seemed to achieve deterrence stability with the former Soviet Union. Obviously, today, the world is very different. It has been just 6 years since the introduction of the New Triad of 2001, and even less time has passed since the new U.S. Strategic Command (USSTRATCOM) was established

Mr. Thomas M. McNamara, Jr. is the National Security Capabilities Program Area Manager in the National Security Analysis Department of JHU/APL. His focus is on assessing DoD capabilities for emerging national security challenges and strategic balance and integration of joint defense capabilities. Previously, he has served as the principal point-of-contact for United States Strategic Command and the David Taylor Naval Ship R&D Center. He has considerable expertise in undersea warfare, autonomous unmanned vehicles and systems, advanced R&D, DoD acquisition, systems engineering, and command and control. Mr. McNamara has served on a variety of technical panels, published technical papers, and presented at numerous symposia and technical meetings.

and given “previously unassigned” missions. More recently, the latest Quadrennial Defense Review (QDR) introduced a new concept of deterrence: tailored deterrence. So, in the context of history, it is fair to stay that we are in the very early days of looking at this new concept . . . this new way of trying to deter our future adversaries. The following primer describes a historical view of deterrence with state and non-state actors:

HISTORICAL PRSPECTIVE ON DETERRENCE

As you read this section, please keep in mind our National Military Strategy of assure, dissuade, deter, defend, defeat. Note that deterrence is the centerpiece of the group. Getting deterrence right will keep us out of the defend or defeat phase of military action.

Deterrence Background:

- 1960s – 1990s: Deterrence chiefly achieved by balance of nuclear threat between USSR and USA.
- 2001: Nuclear Posture Review introduced the “New Triad.”
- 2003: U.S. Strategic Command was assigned “previously unassigned” missions associated with the New Triad and emerging non-nuclear strategic operations.
- 2006: Quadrennial Defense Review introduced concept of tailored deterrence.
- 2007: Assure, Dissuade, Deter, Defend, Defeat

Therefore, it is important that we put our best minds and best efforts toward achieving success in deterrence. Our speakers today are evidence that we are doing just that.

Colonel Lutes from the National Defense University will open this session and is presenting a brief overview of the theory behind tailored deterrence. Dr. Castillo will follow with a discussion of DoD’s policy implementation of that theory. Finally, Mr. Parker will share his insights on the operational implementation of tailored deterrence policy at USSTRATCOM.

3.2 CAN DETERRENCE BE TAILORED?

Charles Lutes

INTRODUCTION

This presentation is taken from a paper by my colleague, Elaine Bunn, which was the result of a number of conversations on the concept of tailored deterrence. As the security environment has changed, we have had to change our approaches to meet new threats. The 2006 QDR alluded to this shift. In fact, even during the 1990s, when a lot of the department was trying to envision the post-Cold War environment, deterrence thinking was still back in the Cold War. We've got to put deterrence thinking into a 21st century model (Figure 1).

Cold War Model…	21st Century Model …
• Single-focused threat	• Multiple, complex challenges
• Nation-state focus	• Focus on rogue powers, terrorist networks, and near-term competitors
• Deterrence by threat of punishment	• Deterrence by punishment and denial
• Responding after a crisis (reactive)	• Preventive actions so problems do not become crises (proactive)
• Deterring use of nuclear weapons	• Deterring use and dissuading acquisition of nuclear, biological, and chemical weapons

Principle of Deterrence

Ensure costs of action are greater than the benefits of action, while taking into account the consequences of restraint.

Figure 1 The Evolution of American Thinking About Deterrence

Colonel Charles Lutes is a senior military fellow at National Defense University, working in the future strategic concepts area. His focus includes, among others, global terrorism, weapons of mass destruction, proliferation, and interagency coordination. He has been a National Security Fellow at the John F. Kennedy School of Government at Harvard. He is currently working on a PhD.

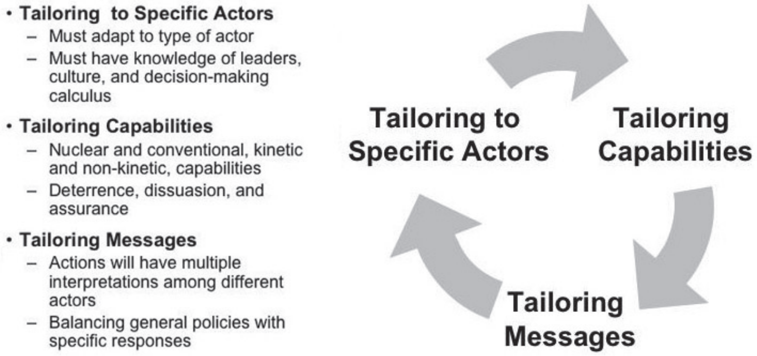
DETERRENCE IN A COMPLEX WORLD

It is a more complex world out there, and there are a number of actors—both state and non-state actors. During the Cold War, deterrence was primarily by the threat of punishment—more specifically, the threat of nuclear punishment. Now, we have to consider not only deterrence by punishment but also deterrence by denial so that the adversary will think twice about conducing certain actions. There is a more preventive tenor to the QDR in 2005; and we are moving away from deterring the use of nuclear weapons to deterring and dissuading the acquisition of WMD, plus other aggressive acts.

It is clear that deterrence has a role in the 21st century model. In fact, the strategic deterrence joint operating concept recognizes that the basic principle of deterrence doesn't change: We have to ensure that the costs of action are greater than the benefits of action, while taking into account that the consequences of restraint may not be acceptable for our adversaries. In other words, if an adversary risks losing a capability or being unable to act if he waits, he might go ahead and use the capability even if he might not necessarily gain a benefit by doing so.

The concept of tailored deterrence was first offered in the 2006 QDR but without a real definition. Ever since, we have been trying to understand it. I will first discuss the terms deterrence and dissuasion. These terms are not synonymous. Deterrence is focused on convincing an adversary to not undertake acts of aggression; whereas dissuasion is aimed at convincing a potential adversary to not compete with the United States or take an undesirable path such as acquiring, enhancing, or increasing threatening capabilities. In a very simplistic sense, deterrence is about deterring the use of WMD or other capabilities; whereas dissuasion is about deterring the acquisition of WMD. For both, however, we have to understand our adversaries. We have to understand how they perceive ours. We must tailor not only deterrence but also dissuasion. We must also tailor assurance because we need to understand how our allies are going to perceive our actions and our words to some of these other players.

Second, I will discuss several aspects of tailoring deterrence as listed in Figure 2. The first is tailoring deterrence to specific actors. We need to differentiate among deterrees because they are not all alike; they are not all the monolithic Soviet Union. There are major powers, rogue actors, and terrorists; and they all have a different way of making decisions. But there are some commonalities amongst these basic groups.



- **Tailoring to Specific Actors**
  - Must adapt to type of actor
  - Must have knowledge of leaders, culture, and decision-making calculus
- **Tailoring Capabilities**
  - Nuclear and conventional, kinetic and non-kinetic, capabilities
  - Deterrence, dissuasion, and assurance
- **Tailoring Messages**
  - Actions will have multiple interpretations among different actors
  - Balancing general policies with specific responses

Tailoring to Specific Actors

Tailoring Capabilities

Tailoring Messages

Figure 2 Three Aspects of Tailoring Deterrence

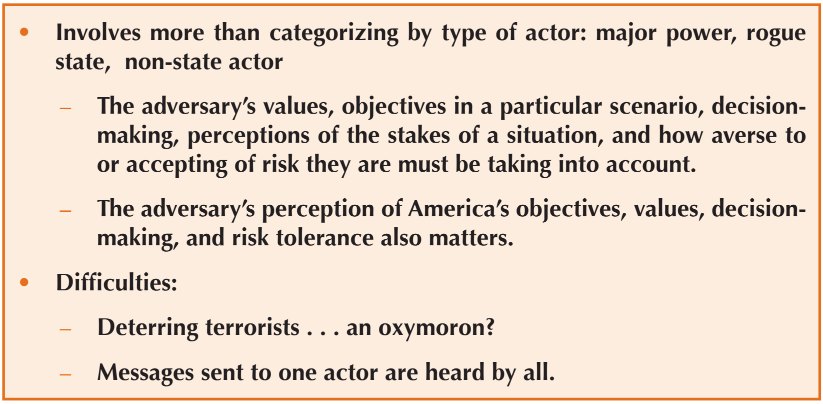
Ambassador Ronald F. Lehman has said that, "tailored deterrence has to be context-specific and culturally sensitive." We need to understand our adversary's culture and the context in which he operates. Not only do we tailor for specific actors, we also have to look at their possible actions. We may have to vary how we treat them based on which actions we are trying to deter.

Next, we have to tailor capabilities. Capabilities have to be clarified, both broadly and narrowly, because we do not have a good sense of what constitutes a good mix of capabilities for deterrence, partly because it is very hard to measure deterrence. It is easy to measure our capabilities; it is not easy to measure how they affect the decision-making calculus of the adversary. Although we seem to be doing very well in deterrence lately, that metric could change in a heartbeat. Also, we are no longer the domain of nuclear weapons or nuclear forces for deterrence. There are a number of other aspects to capabilities: conventional aspects, nonkinetic aspects. Information operations play a very large role in deterrence.

Finally, we need to be able to tailor our communications. We have a distinct problem in communication with our adversaries and with others on the global scene that can actually hinder our ability to deter specific actors from conducting specific actions.

Specific Actors

Specific actors can include major powers, rogue states, and terrorist networks (Figure 3). During the Cold War, the United States spent enormous amounts of time, energy, and effort to understand how the Soviets thought and what might deter them. That knowledge was not easily obtained and often there were differences in opinion about the Soviet thinking. Now, the set of actors is much more diverse, which makes the equation much more complex. Major powers are easier to deter because major powers are going to be more risk averse. They are also going to perceive their stakes as equivalent to those of the U.S., and they are likely to be less concerned about regime change. This makes for a symmetric situation.



- **Involves more than categorizing by type of actor: major power, rogue state, non-state actor**
  - **The adversary's values, objectives in a particular scenario, decision-making, perceptions of the stakes of a situation, and how averse to or accepting of risk they are must be taking into account.**
  - **The adversary's perception of America's objectives, values, decision-making, and risk tolerance also matters.**
- **Difficulties:**
  - **Deterring terrorists . . . an oxymoron?**
  - **Messages sent to one actor are heard by all.**

Figure 3 Tailoring to Specific Actors

We have a better communication avenue with major powers than we do with what are known as rogue states. We have less confidence in our ability to deter these states, primarily because the stakes involved are asymmetric. In fact, it is unlikely that the United States would use a strategic capability, particularly a nuclear capability, in response to low-level actions—and they know that. There is also a perceived existential threat by these rogue states that makes the situation a little different. More importantly, they're unfamiliar with how we make decisions because they haven't really studied us in this context.

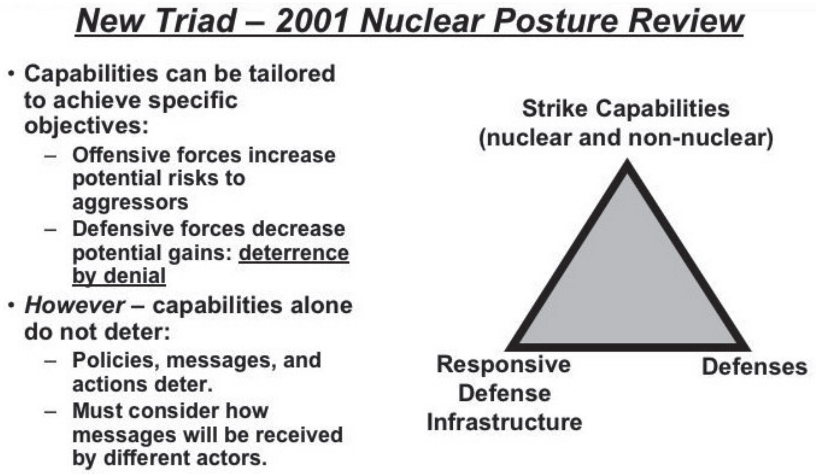
"In a very simplistic sense, deterrence is about deterring the use of WMD or other capabilities; whereas dissuasion is about deterring the acquisition of WMD."

It is clear that terrorists, such as al Qaeda and Hizbollah, present another unique challenge. In May 2006, in a commencement address at West Point, President Bush said, "The terrorists have no borders to protect or capital to defend; they cannot be deterred, but they will be defeated." But can they be deterred? Is deterring terrorists really an oxymoron? Denying benefits to these actors may be some deterrence—a suicide bomber does not want to die for no reason; he does not just walk across a busy street because he wants to be a martyr; he needs to have a result. So, making these actors believe that their results will be ineffective is a way of denying the benefits.

What about actions? What do we want to deter them from doing? Lesser acts—low-level actions that don't directly affect U.S. vital interests—may be harder to deter. The QDR stated that we should be deterring use of WMD, terrorist attacks in the physical and information domains, and opportunistic aggression. Those are some of the deterrence actions we could take, but there are others. What kind of questions de we need to ask about the actors that we're trying to deter? What are the nation's or group's values or priorities? How are these values affected by the actor's history and strategic culture? What are their objectives in a particular situation? Who makes the decisions? How do they calculate risks and gains? What do they believe they have at stake? How risk-averse are they? What do they perceive as America's answers to these questions? For example: What are our objectives? What are our stakes? What is our propensity for taking risk in a deterrence or dissuasion context?

Tailoring Capabilities

The Nuclear Posture Review—which should have been called the Strategic Posture Review—of 2001 developed a new triad that considers nuclear and non-nuclear capabilities for offensive strike, both kinetic and nonkinetic, and information operations (Figure 4). It includes active defenses, such as missile defense, and passive defenses as well as a responsive infrastructure to enable those defenses. The QDR in 2005 narrowed the idea of terror deterrence, associated it primarily with the new triad, and called it the primary capabilities for deterrence. That is true; there is a primary set of capabilities for deterrence, but that is a limited view. The capabilities of the new triad affect different sides of the discussion calculus—for instance, threat by punishment, threat of denial. Broadly defined, offensive forces increase the potential risks to the aggressors and, as the defense decreases, their gains. For some, the new triad capabilities are still a code word for nuclear weapons and developing new nuclear weapons with niche capabilities, optimized for specific characteristics such as low-yield earth penetration, reduced residual radiation, or biological agent defeat. That is, again, a very narrow view of what the new triad should be and actually what we need for deterrence.



New Triad – 2001 Nuclear Posture Review

- Capabilities can be tailored to achieve specific objectives:
  - Offensive forces increase potential risks to aggressors
  - Defensive forces decrease potential gains: deterrence by denial
- *However* – capabilities alone do not deter:
  - Policies, messages, and actions deter.
  - Must consider how messages will be received by different actors.

Strike Capabilities (nuclear and non-nuclear)

Responsive Defense Infrastructure

Defenses

Figure 4 Tailoring Capabilities

The other view is that the capabilities not only in the new triad but also in the force posture at large mean a wider range of capabilities than just nuclear: improved options for conventional global strike and nonkinetic options, such as computer network attack, as well as defenses of all kinds. One example is the conventional Trident missile. It provides us the capability to strike distant targets globally, such as terrorist enemy camps, missile sites, or suspected WMD caches, within a short period of time—in other words, global strike. Currently, if there are no deployed forces, the only option we have for rapid, global reach is our nuclear force. That is clearly not acceptable for dealing with these new threats.

"In fact, it is unlikely that the United States would use a strategic capability, particularly a nuclear capability, in response to low-level actions—and they know that."

There is an even broader view that says our capabilities, such as forward presence, force projection, and allied cooperation, are all part of the deterrence equation. The capabilities can be broken down into two categories: direct means and enablers.

1. Direct means directly and decisively affect the decision-making calculus of the enemy. These include force projection, active and passive defenses, global strike—nuclear, conventional, kinetic, and nonkinetic—and strategic communications.

2. Enablers are those that indirectly impact or favor: situational awareness, command and control, forward presence, security cooperation, etc. Capability-based planning may be good for determining the type of capabilities, but it doesn't necessarily help us in developing the proper mix and telling us how they should be employed. Some work is needed on capabilities.

Tailoring Communications

The final aspect of tailoring deterrence is tailoring messages or communications (Figures 5 and 6). The messages are sent by the U.S. in both words and action. More important is how those words and actions are perceived by the adversary. For instance, flexible deterrent options are an example of a specific kind of action that would enhance our deterrent posture. Declarative policy, or official statements, must be consistent with U.S. values, systems, government, and national character. It is also possible to have nonpublic declarative policy, such as when James Baker delivered a letter from [the first] President Bush to President Hussein on the eve of the first Gulf War, which warned that Iraq would pay a terrible price if Hussein used chemical or biological weapons. That message has been credited with its decision not to use chemical weapons.

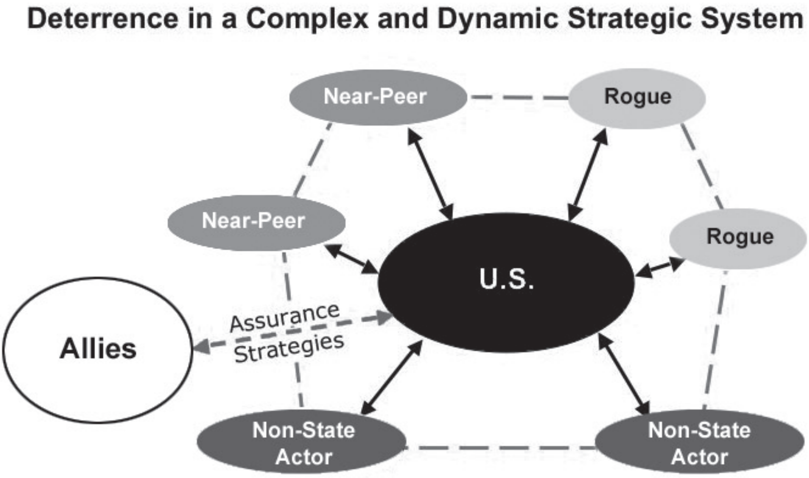


Figure 5 Tailoring Messages (1)

Dealing with Complexity:

- **Specific actions, stated policy, and the "Cacophony of public opinion" can contribute to (or detract from) our deterrent posture.**
- **Communications in peacetime are probably more important than words said or actions taken in times of tension.**
- **Risk of different actors taking different "lessons" from U.S. actions: Example: Operation Iraqi Freedom**
    - **Iran and North Korea accelerated their WMD programs.**
    - **Libya renounced theirs.**

Are there a universal deterrence message and set of actions?

Figure 6 Tailoring Messages (2)

We need to match words and deeds because all the actors are paying attention—we cannot have a one-to-one communications relationship. Iran is listening to what we say and what we do about North Korea. Our allies are watching, and they need to be assured. This issue is difficult and complex. Stated policy can sometimes undermine deterrence as well as enhance it. If we do not stand behind stated policy, our deterrence efforts can suffer. Credibility and the ability to be effective are important. Public opinion matters. If we are not really sure what the right position is, the cacophony of public opinion might plant uncertainty in the minds of our adversaries.

CONCLUSIONS

The feasibility of this implementation of terror deterrence is still unknown. But falling back onto old concepts of deterrence is not an option. We have to be more adaptable. The increasing complexity and dynamic threat environment demand no less. One of the main points about communications is that the message intended is less important than the message received (Figure 7).

- **Tailored deterrence involves a three-part approach:**
  - **Tailoring to specific actors**
  - **Tailoring capabilities toward specific goals**
  - **Tailoring messages in a complex globalized system**
- **Must consider deterrence, dissuasion, and assurance strategies in peacetime and in times of crisis**
- **The United States needs to continue to shift from a "one-size-fits-all" notion of deterrence toward more adaptable approaches.**

The message intended is less important than the message received.

Figure 7 Overview of Tailored Deterrence

3.3 TAILORED DISSUASION AND DETERRENCE?

Jasen Castillo

INTRODUCTION

The logic of deterrence or coercion is still sound. What has changed is the environment. We are faced with an array of actors with differing capabilities and motives, which complicates our decision-making about the kinds of threats that would dissuade or deter.

DISSUADING AND DETERRING URW

How can we dissuade and deter unrestricted warfare? Are there certain conditions or characteristics that we need to take into account to make more convincing threats? Shall we create conditions where competition is not favorable or create incentives for adversaries to cooperate with us? Our adversaries have strong incentives to avoid force on force and to use unrestricted warfare means in conflicts where the stakes are very high for them. To deter unrestricted warfare, we have to deter conflict, which is hard to do when the balance of the stakes does not favor us in a conflict. If our adversaries think they have more at stake and they must fight, it is easier to fight against states.

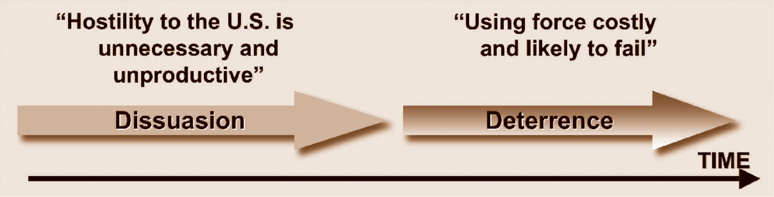
Dr. Jasen Castillo is an analyst in the Office of the Undersecretary of Defense for Policy. Dr. Castillo worked at the Rand Corporation, where he led and participated in studies on nuclear and conventional deterrence. He holds a Ph.D. in Political Science from the University of Chicago and will shortly join the faculty at Texas A&M's Bush School for Public Policy and Government Affairs.

Successfully tailored dissuasion and deterrence depend on identifying the correct mix of costs and benefits to influence the calculations of our adversaries. During the Cold War, we tried to tailor deterrence against the Soviet Union. We are having the same kind of discussion today about an array of different actors.

THE CARROT AND THE STICK

The terms dissuasion and deterrence are familiar. Dissuasion (i.e., general deterrence) in this context means discouraging states from competing with the United States because it is costly or it is not beneficial. Dissuasion should also be balanced with incentives for cooperation. The carrot should go along with the stick—we should provide incentives for cooperation along with increasing the cost of competition. The same goes for deterrence. Our opponents need to know that we can hurt them or deny them, but also that we will restrain ourselves (Figure 1).

- **Dissuasion**
  - Discourage state and non-state actors from competing with the U.S. by developing capabilities, strategies, and hostile motives:
    Balance by creating incentives for cooperation.
- **Deterrence**
  - Threaten punishment or denial to discourage individuals and groups from attacking U.S. interests:
    Balance by reassuring opponents threat is conditional.



"Hostility to the U.S. is unnecessary and unproductive"

"Using force costly and likely to fail"

Dissuasion

Deterrence

TIME

Figure 1 Dissuasion and Deterrence

Dissuasion and deterrence happen over time and require the three Cs: capabilities, credibility (the actions and statements that make our threats believable), and communication (Do the adversaries understand us? What are their perceptions?).

HOW TO STRIKE A BALANCE

One place to start in our consideration of dissuasion and deterrence is our baseline for all our deterrence theory—the Cold War. Because dissuasion is about competition, how do we view long-term military competition with a variety o actors in the international system? In the case of a near-peer competitor, how do we establish an enduring situation that (a) will allow us to defend better, defeat the adversary, and deescalate should deterrence fail; and (b) will allow us to win that long-term military competition without being too provocative and making our adversaries implacable aggressors?

In international relations, we must be provocative to deter, but being provocative may convey potentially malevolent intentions to an adversary. We need to think about how a long-term competition is going to evolve with countries like China. We need to understand this debate between competing and cooperating because we do both. The real difficulty is how to do both in a way that does not start a new Cold War.

Here, the focus is on deterrence. The strategic environment favors unrestricted warfare in confrontations with the United States as opposed to the Cold War, when our conventional weakness led us to compensate by making implicit and explicit nuclear threats. It was a situation where the stakes were high for both sides. Today, we want to emphasize our conventional forces because they are superior. However, if we face adversaries whose stakes are higher than ours, they will have great incentive to turn to strategies that we perceive as unrestricted to deter U.S. intervention in the conflict.

In the background are our allies. Our allies were largely worried about being abandoned during the Cold war. Today, they are worried about being not only abandoned but also getting entrapped. Tailored deterrence was a Cold War term that meant understanding our adversaries' perceptions of costs and benefits. Today, we need to apply that same principle to our allies. Does Japan, for instance, want to help the United States defend Taiwan? Is it worried about being entrapped in that conflict? Does it see stakes in that conflict? These are the kinds of questions we need to ask. If the stakes are high, a conventionally weak adversary is going to turn to unrestricted warfare, either in strategy or tactics.

Elements of tailored deterrence or any kind of coercive policy have to take into account how our adversaries think about costs and benefits. What motivates them—fear or opportunism or both? What implications does it have for our threats? How can we get them to understand inducements, and what is the right balance between competition and cooperation? These considerations influence decision making about dissuasion as well as deterrence. We need a better understanding of how our adversaries calculate costs and benefits. We need a baseline to think about deterrence.

CHARACTERISTICS AND DANGERS ASSOCIATED WITH VARIOUS ACTORS

Table 1 is a list of possible missions we would want to deter. The shaded items are in the domain of unrestricted warfare.

Table 1 Possible Deterrence Missions

Missions	
Limited Aims; Quick Land Grabs	
Conventional Aggression on Allies	
Attacks on Homeland or Allies	Domain of Unrestricted Warfare
Coercion Against Allies	
Transfer of Nuclear Materials	
Support of Insurgencies	
Escalation in a Conflict	
Deterring Coercion, Conflicts, and Escalation	

Table 2 lists the categories of adversary characteristics that will influence decision-making about deterrence. Are our adversaries worried about their external security environment, or are they more revisionist? Are we taking actions that generate misperceptions? What about their internal insecurity? We now know that Saddam Hussein took extensive measures to coup-proof his regime, measures that impacted the military effectiveness of the Iraqi army on the battlefield. Will a desire to avert a coup affect our adversaries' decision-making capabilities?

Table 2 Adversary Characteristics Complicating Deterrence and Dissuasion

Characteristics
External Insecurity
Revisionist Motives
Misperceptions
Internal Insecurity
Poor Decisionmaking Capacity
Asymmetry in Stakes
Asymmetry in Capabilities
Vulnerable Forces
Difficult to Punish
Characteristics Associated with Near-Peer or Regional Competitors, Rogue States, and Nonstate Actors

How does the enemy perceive the stakes in the conflict? An asymmetry of capabilities may mean that the enemy will use unrestricted warfare. But what about asymmetries in the vulnerability of the retaliatory forces? The difficulty is how to punish adversaries whom we can't find or how to hold them hostage when they are willing to bear a great cost in pursuit of something they see as valuable.

Internal and External Insecurities

Our assessment of these characteristics will have implications for how we deter a conflict from the start. For instance, if an adversary is worried about external insecurity and misperception, he is more likely to embark on defensive aggression. In that case, we want to consider strategies that do not exacerbate those external fears.

"Dissuasion and deterrence happen over time and require the three Cs: capabilities, credibility (the actions and statements that make our threats believable), and communication (Do the adversaries understand us? What are their perceptions?)."

Some adversaries also have internal security problems, largely stemming from the process of democratization. Jack Snyder and Ed Mansfield showed that states undergoing democratization tend to turn to foreign adventurism and foreign provocation to solve their domestic problems.[1] It is probably going to be very hard to deter those countries. Their decision-making capability will be poor, which means that the general staff of a particular dictatorship is probably not going to tell its leader that the military balance does not favor aggression. It is going to make miscalculations. Even though the conventional balance may not favor it, it may still embark on aggression.

During a conflict, the asymmetry and stakes are going to cause these adversaries to deliberately escalate a conflict. When they begin to lose because of our conventional superiority, they may turn to chemical, biological, or even nuclear responses to convince us that the stakes are not worth the gamble.

[1] E. D. Mansfield and J. Snyder, *Electing to Fight: Why Emerging Democracies Go to War*, Cambridge: MIT Press, 2006.

ADVERSARY CATEGORIES

The typical categories of adversaries are near-peer competitors, rising regional powers, rogue states, and nonstate actors (Table 3).

Table 3 Associated Dangers

Characteristics	Dangers
External Insecurity and Misperceptions	Defensive Aggression
Revisionist Motives	Opportunistic Aggression
Internal Insecurity	Conflicts to Divert Domestic Problems
Poor Decision-Making Capacity	Conflicts Caused by Miscalculation
Vulnerable Nuclear Forces	Preemptive Escalation
Asymmetry in Stakes	Deliberate Escalation in a Conflict
Asymmetry in Capabilities	Inadvertent Escalation in a Conflict
Difficult to Punish	No Restraints on Violence
Dangers Associated with Near-Peer Competitors, Rogue States, and Nonstate Actors	

Near-Peer or Rising Power Competitors

For the near-peer or rising power, the danger is the ambiguity of our deterrent threats and their fear of our conventional military power. In those situations, we want to emphasize dissuasion—to convince the adversary that there is some form of competition; but it does not threaten their core interests. More importantly, we want to delineate the lines where U.S. interests are firm and the adversary's interests are firm so that there is no miscalculation about what we will and will not fight for. We do not want to create ambiguity that invites aggression.

If we do exercise our formidable conventional forces in a conflict in a way that would defeat the adversary, the danger of inadvertent escalation is always present. What we think of as regular operational conventions may look to an adversary—especially, if he has a small nuclear arsenal—like the precursor to a conventional or a nuclear counterforce strike. For the near-peer competitor, then, we need to reduce ambiguity about what we will defend and about our commitment to our allies and, particularly, avoid creating inadvertent escalation.

Rogue State

The characteristics that make a state rogue also make this adversary harder to deter than a near-peer or rising competitor. Its decision-making or revisionist motives lead it to be more accepting of risk. For dissuasion, we need to demonstrate that competition with the United States threatens its core interests. This state is going to look for windows of opportunity to seize territory, present the United States with a fait accompli, and dare the U.S. to dislodge it. In those situations, we have to make the lines clear and the threats clear. We also want to bolster the denial of conventional forces of our allies so they do not present tempting targets. We want to have plans for managing escalation against these types of adversaries because, in a conflict, they will have incentives to use unrestricted warfare. We should explore damage limitation capabilities because deterrence is likely to fail for the reasons that generated the conflict in the first place and because these states, once they get into a conflict with the United States, are likely to worry about their own survival. The greater part of our decision-making here is on damage limitation.

Nonstate Actor

Finally, for the non-state actor, the danger is that this adversary has revisionist motives. It is difficult to punish him because there is nothing we can hold hostage, and his ideology makes him immune to pain. The asymmetry in stakes and capabilities means he is going to escalate and pursue unrestricted warfare in a conflict.

IMPLICATIONS

This environment has implications for us in several areas: Policy and Strategy, Intelligence, Capabilities, Global Posture, and Security Cooperation.

Policy and Strategy

Typically, we think of terrorists or insurgents as undeterrable. Elaine Bunn[2] outlined these arguments very concisely in a recent article. We need to consider strategies to break up the terrorist's network. Can we cajole or threaten its state sponsors with a variety of inducements or punishments? Can we dissuade the less motivated members of these movements by freezing their financial assets, threatening their families, or jailing them?

"More important, we want to delineate the lines where U.S. interests are firm and the adversary's interests are firm so that there is no miscalculation about what we will and will not fight for. We do not want to create ambiguity that invites aggression."

We are dealing here with an imbalance of stakes and a perceived lack of our credibility: how we behave in one conflict has implications for another conflict. We are going to make different decisions in the Middle East than in east Asia. We want to have the adversary focus on our forces in the region and pay less attention to our reputation or how we behaved in previous crises.

We need to understand and derive plans for managing nuclear escalation and reduce the incentives for our adversaries to acquire nuclear weapons. Our allies need to protect themselves from

[2] E. Bunn, "Can Deterrence Be Tailored?" Strategic Forum (National Defense University), No. 225 (January 2007)

becoming tempting targets so that we are not forced to dislodge rogue states that may have small nuclear arsenals.

Intelligence

We need to develop an understanding of the adversary's ideological forces, their motivations, and their world views. The Islamist movement is not monolithic; we can try to work with groups that may be less extremist. We also need to develop and deploy new sensor technologies such as remote sensing of concealed and shielded nuclear materials.

Capabilities, Global Posture, and Security Cooperation

Capabilities for deterring terrorist threats should include both kinetic (i.e., military) and nonkinetic tools (such as freezing assets and restricting travel). We must use our new global posture to reduce the vulnerability of key military assets and reassure our allies. We can make more credible threats by moving to a hardened basing posture in a region. Finally, we must develop new friends and allies through security cooperation, which will not only improve our relationships and reassure our allies but also strengthen their capabilities so they do not present tempting targets.

CONCLUSION

U.S. conventional superiority creates strong incentives for adversaries to use unrestricted warfare. Consequently, preventing conflict through dissuasion and deterrence is the best way to protect U.S. interests from the effects of unrestricted warfare. Further, successfully tailored dissuasion and deterrence require strategies that recognize the characteristics of near-peer competitors, rogue states, and nonstate actors that motivate their use of unrestricted warfare.

3.4 QUESTIONS AND ANSWERS HIGHLIGHTS

Transcripts

Q&A

Q: We'll start with a question for Dr. Castillo and Col. Lutes. "How does the ability to identify the origins of a URW attack—who the adversary is—affect our ability to deter the various actors we face?" I suppose the question may perhaps deal more with cyber attack where attribution might be difficult, but it may also be more general than that.

Col. Charles Lutes – Attribution is very important, but what is just as important is our adversaries' estimate of our attribution capability. I do a lot of work with WMD and the issue of attribution, particularly for the terrorist use. We need to be able to attribute where a nuclear device came from or where the material might have come from. If the state sponsors believe that we can attribute the source of such material, they'll think twice about distributing it to anybody else.

Dr. Jasen Castillo – We think attribution might be a tricky issue because there's a tradeoff: How much do you want your adversary to know about your attribution capabilities? The more knowledge you share about your attribution capabilities, the more they might think, "We know the U.S. focuses on bomb designs, so we'll steal a bomb; and we'll use it on the U.S. homeland. That will really complicate their decision-making." You don't want to open yourself up to that kind of threat. Conversely, you do want states to know that you have the ability to do nuclear forensics because, again, attribution usually has a state address. We're worried about states giving these nuclear weapons or chemical/biological weapons to terrorist groups, and you want states to know that you can attribute those weapons to them and that they have return addresses.

Col. Charles Lutes – There's also a time element in terms of forensics and attribution. If we can do the forensics to figure out where the weapon came from, but it takes us a month, that's not sufficient to deter the adversaries or to take the next action. There's also an issue of whether our ability is credible on the international stage. We've had problems with our intelligence community in terms of the WMD issue in Iraq. It's going to take a higher standard now to definitely attribute something to an adversary.

Mr. William Parker – The attribution issue, even when we can attribute a weapon or action, is what we can do about it? Who do you go after? Who do you strike? How do you do it? How do I present forces? What is the face of my response? Do I have a response? The time factor is really critical.

Q: *Tailored deterrence is not one-size-fits-all, and it's probably on a timeline—it's not one plan staged continuously throughout the whole event. There's a famous quote: "Enemies have a say in the outcome, and no plan survives first contact with the enemy." How can we analyze and assess the deterrence value of particular courses of action, particularly ones that we've already started? Taking the example presented here, what deterrence value does Operation Noble Eagle have in preventing a terrorist attack? What abilities do we have, or what capabilities do we need to have in place to measure the cause and effect of our messages, our actions, etc.?*

Mr. William Parker – Part of the answer is the assessment piece that we talked about, which is very, very critical in an analytical capability—assessment of perceptions, culture, all of the cognitive issues that we discussed. Are we really up to speed inside the minds of the people that we will have to engage and that we're watching or listening to or exploiting at any given moment?

The shift in the nature of deterrence is how specific we must become in the engagement continuum pre-phase zero. As we move into warfighting, we have to be very specific about what we're trying to deter in an adversary's decision calculus and assess just as specifically precipitators, audience reaction, how our message was perceived, etc.

Col. Charles Lutes – Operation Noble Eagle was mentioned, and that raises the issue that I assume Brad Roberts covered yesterday: Why hasn't the dog barked? Why haven't we been attacked in the homeland again? It's not just capability; it's not just

Noble Eagle. It's our homeland security posture. It's a very difficult thing to analyze because it's synergistic and it's complex. A lot of times, we end up measuring inputs rather than the outputs.

Dr. Jasen Castillo – I'm going to depart slightly from the emphasis on tailored deterrence, which involves understanding all of the complexities and nuances of our adversaries. I'm going to say that maybe we don't know the nuances of our adversaries, so let's go back to basics and think about the kinds of missions they're trying to execute and the likely strategies they're going to use to pursue those missions. Noble Eagle is a denial threat—it makes it harder for the adversaries to carry out their missions. Sometimes, you do want to plan to defend because, by planning to defend, you make it harder for the adversary to execute the offensive strategy. Planning to defend gives you a first cut, some metrics, to evaluate effectiveness because sometimes the dog does not bark. The enemy doesn't attack, and you don't know why. You want to be able to judge if you're able to defend; and if so, whether you can deter.

Mr. William Parker – Planning to defend is different than planning to defeat. I sometimes get the sense that defend always takes a backseat. I have no argument with that, but planning to defeat is actually the lesser option.

Dr. Jasen Castillo – There's an assumption that, when you move into the warfighting phase, you're no longer coercing; you're using brute force, and you're going to disarm the enemy. That has unintended consequences, and it's wrong not to think of that in a coercive framework.

Q: *We had a question about an assessment of deterrence value. That would be what we in the analysis world call experimentation; but in reality, in this context of deterrence, it would be real-time experimentation. Are we, for lack of a better term, probing? Are we initiating actions with potential adversaries for deterrence partners, etc., to generate or stimulate a response so that we can get smarter about those adversary responses and then feed them back into our tailored deterrence plan? Do we have the capability of doing that today, and are we doing that?*

Dr. Jasen Castillo – I don't know about that capability; but as a building block, one of the things that our office is thinking about is how to dissuade. It sounds good in practice; but it's very difficult because, in an ideal world, you would convince your adversary not to compete with you at all. The question is: Can you shape that competition in ways that are useful and beneficial to you? We also want to think about the different steps in that competition. This is the input to any kind of simulation or modeling, but we want to start thinking about dissuasion as a long-term competition: What those steps entail, the unintended consequences of what we might do, and how we shape them and force them to pursue particular actions that are advantageous to us. How do we force an adversary to go down a road that actually makes deterrence easier for us?

Mr. William Parker – I agree with everything you've said. I'm a real stickler for taking every opportunity to make contact and engage because that establishes a record of behavior that we should be able to funnel to the technologists and the analysts to create what-if scenarios. There's been this tendency to engage too little and too late—and entities and people don't respond to too little, too late.

Col. Charles Lutes – I'm a big believer in red teaming. I don't think we do enough, and I'm not sure that we do it properly. A lot of times, you'll get a bunch of military guys and say you be blue and you be red, and let's play it out. What you really need to have on a red team is people who are steeped in the culture and the decision-making process of the adversary. They certainly will have a different outlook than our standard military planners. I think that's what we need to move to in terms of experimentation.

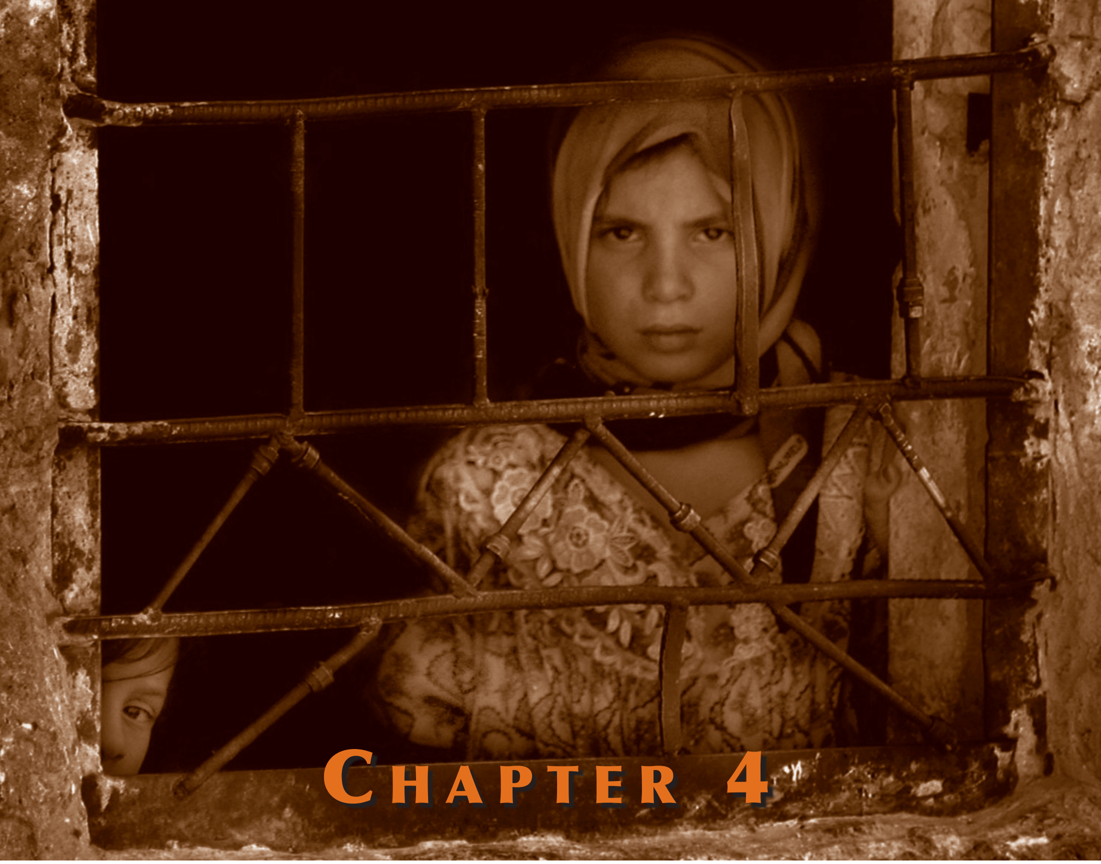
Mr. William Parker – Some of the most dynamic and sharpest people in uniform I've ever met are the foreign area experts. The entire personnel system has to change somehow to allow these people to rise up through the ranks. We put a lot of money and effort into these folks, but they never make it through the system as quickly as others.

Q: We look at deterrence, and we think of the challenges in the area of tailored deterrence; but the "M" part of DIME is just one fraction of the whole set of means available to us. Certainly, a lot of the economic, the commercial, and the informational will be driven more by nongovernmental activities; we certainly see that in the globalization reach to China. One of the encouraging results of the China situation is the close economic ties between our two nations. Are there any plans in place to try to better leverage the nongovernmental elements that are available to us to understand the adversary, to tailor our messages, etc.?

Mr. William Parker – That's one of my pet peeves. You talk about people with exquisite situational awareness, people whose livelihoods depend on black ink. That's the e-concept. When you're overseas or down range and usually in a remote part of the world, there is no chancellery; you're it. The Pepsi distributor, the MacDonald's distributor, Mr. Pizza Hut; they can make you a star. For some reason, as you get over one of the big ponds, either east or west, the people become capitalists. We don't engage them, and they don't come to us. It's almost like you need departmentalism. We need a global outreach corps that will make the Peace Corps look like Cub Scouts and get out there and unmask, then engage.

Col. Charles Lutes – This is clearly a problem. In general, we don't have a good system for getting all elements of national power together. I'll give you an example. Right now, we're conducting a big project at NDU [National Defense University] to write a theory of space power. What is space? How does it contribute to the elements of national power? We found that there's a different approach in the civil, commercial, and military realms to looking at space. That's something we need to work on because other nations are better at it.

Dr. Jasen Castillo – I'm kind of old-fashioned on the DIME issue. There's good historical evidence that strong economic ties don't prevent states from going to war. In terms of diplomacy, a lot of talk is cheap. Recognizing those two factors means that you focus on the military. That's one way of making costly signals and creating less ambiguity in deterrent situations.



Chapter 4

ANALYSIS ROUNDTABLE

Analytic Successes and Applicability to URW

4.1 MODERATOR'S SUMMARY

L. Dean Simmons

The objective of the 2007 URW Symposium's Analysis Roundtable was to discuss analysis approaches that have worked well in the past and, where possible, to extrapolate their applicability to the intelligence, operations, and capability assessments that will be needed to respond to the demands imposed by URW. As the symposium has stressed, however, the analysis community does not work in a vacuum but, rather, provides the assessments that are needed by the Strategy and Technology communities to make choices on overall U.S. military strategy and the force structure, force employment, and system concepts that will best enable its implementation. The strategy and technology communities, in turn, provide essential inputs to the analysis community.

The relationships among the three communities are outlined in more detail in Figures 1 and 2. Figure 1 shows the interconnections between strategy and analysis. As indicated, the strategy community identifies the measures of success that

Dr. L. Dean Simmons is a National Security Studies Fellow at The Johns Hopkins University Applied Physics Laboratory. Dr. Simmons served as an Assistant Director in IDA's System Evaluation Division, developing expertise in manned and unmanned tactical aircraft, rotary wing aircraft, surface ships, and combat lessons learned assessments. He has twice received IDA's prestigious Andrew J. Goodpaster Award for Excellence in Research. Early in his career he served at the Center for Naval Analyses, specializing in amphibious warfare systems. Dr. Simmons has contributed on the Defense Science Board, Naval Studies Board, and Air Force Scientific Advisory Board. He has published articles in the Journal of Defense Research, the Marine Corps Gazette, Vertiflite, and the Proceedings of the Naval Institute.

can be used to quantify the outcomes of URW conflicts. Using these measures, the analysis community provides assessments of the risks and benefits of alternative strategic postures and force-employment courses of action as well as measurements of force and system capabilities.

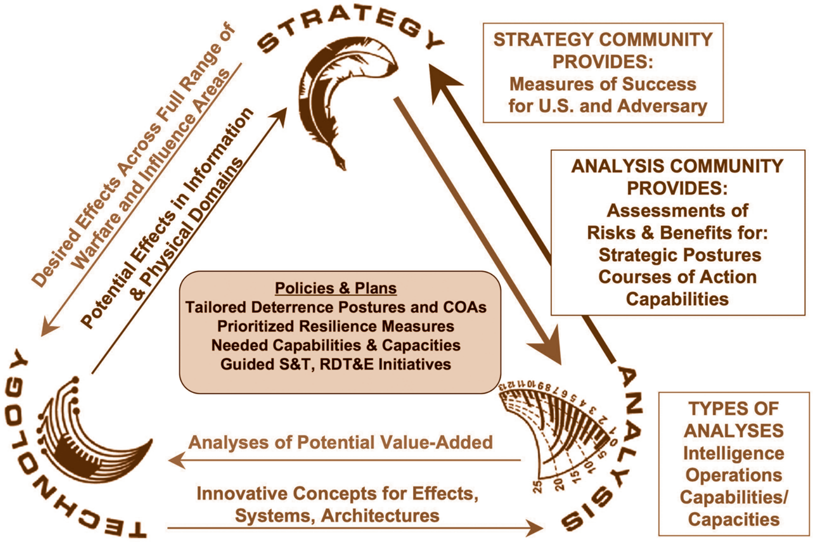

STRATEGY
STRATEGY COMMUNITY PROVIDES:
Measures of Success for U.S. and Adversary
ANALYSIS COMMUNITY PROVIDES:
Assessments of Risks & Benefits for:
Strategic Postures
Courses of Action
Capabilities
Desired Effects Across Full Range of Warfare and Influence Areas
Potential Effects in Information & Physical Domains
Policies & Plans
Tailored Deterrence Postures and COAs
Prioritized Resilience Measures
Needed Capabilities & Capacities
Guided S&T, RDT&E Initiatives
TECHNOLOGY
ANALYSIS
Analyses of Potential Value-Added
Innovative Concepts for Effects, Systems, Architectures
TYPES OF ANALYSES
Intelligence
Operations
Capabilities/
Capacities

Figure 1 Relationship Between Analysis and Strategy Communities

Figure 2 shows the interconnections between the technology and analysis communities. The analysis community provides assessments of the potential value added of new concepts for specific military technologies, systems, or effects identified by the technology community. The technology community, in turn, provides the analysis community with specifics regarding the technical characteristics and performance parameters of the technologies, systems, and effects of interest. Although the analysis community's technology-related assessments have a different focus than the strategy-related assessments, both types of assessments should be based on the URW measures of success identified by the strategy community.

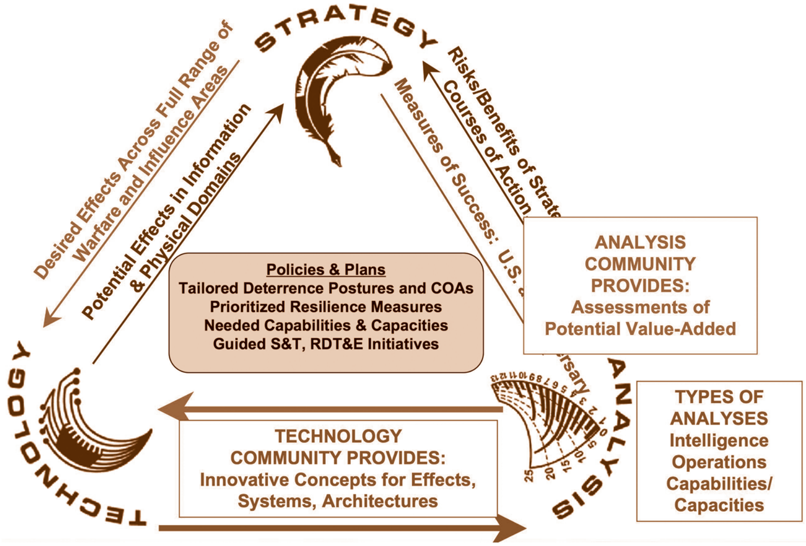

STRATEGY
Desired Effects Across Full Range of Warfare and Influence Areas
Potential Effects in Information & Physical Domains
Risks/Benefits of Strate
Courses of Action
Measures of Success: U.S. &
rsary
Policies & Plans
Tailored Deterrence Postures and COAs
Prioritized Resilience Measures
Needed Capabilities & Capacities
Guided S&T, RDT&E Initiatives
ANALYSIS COMMUNITY PROVIDES:
Assessments of Potential Value-Added
TYPES OF ANALYSES
Intelligence
Operations
Capabilities/
Capacities
TECHNOLOGY COMMUNITY PROVIDES:
Innovative Concepts for Effects, Systems, Architectures
TECHNOLOGY
ANALYSIS

Figure 2 Relationship Between Analysis and Technology Communities

SUGGESTED ACTIONS FROM THE 2006 URW SYMPOSIUM

To conduct quantitative analysis of the strategies, operations, tactics, systems, and technologies that might be employed to combat URW, the 2006 URW Symposium's Analysis Roundtable recommended that the analysis community (1) expand the set of success criteria beyond the traditional conventional warfare measures of damage inflicted on an adversary and own forces and territory gained or lost in the course of military operations, (2) identify and use measures of effectiveness that show defensive as well as offensive options, (3) include the perspectives of the knowledge and behavioral sciences in addition to those of the physical sciences, and (4) incorporate mathematical and quantitative techniques from these other scientific disciplines when developing tools and assessment approaches for examining URW.

ROUNDTABLE PERSPECTIVES

The 2007 URW Symposium's Analysis Roundtable provided three perspectives on the analysis community's progress in implementing the recommendations identified last year.

Mr. Timothy Bright: Assessing Irregular Warfare

The first presentation was by Mr. Timothy Bright from the new Irregular Warfare Division within OSD's Program Analysis and Evaluation Directorate. Mr. Bright framed his perspective by noting that there are many questions surrounding irregular warfare that require evaluation, but traditional analytic tools and approaches do not appear to be applicable for this purpose. At the same time, however, development of new assessment tools is proceeding slowly; and PA&E has relied on wargames and informed judgments to provide insights. Mr. Bright expects that it will take some time for the analysis community to develop enough corporate analytical expertise to have confidence in a new generation of irregular warfare-specific analysis techniques. In the interim, decision-makers and the analysts who support them will have to rely on rules-of-thumb that fit the available data.

Dr. Andrew Ilachinski: Complex Adaptive Systems, Multiagent-Based Models, and Some Heuristics Regarding Their Applicability to URW

The next presentation was by Dr. Andy Ilachinski from the Center for Naval Analyses. According to Dr. Ilachinski, the complex nature of URW makes untenable the traditional analysis approach of searching for, or computing, "optimal solutions." Analysts can no longer afford to ignore qualitative factors such as the effects of human interaction and reasoning. The explanatory mechanisms that relate the many aspects of URW problems are not "simply" linear as is assumed in many, if not all, of the detailed, high-resolution scripted models used by the community. Dr. Ilachinski goes on to explain that complex adaptive systems and multiagent-based models provide a means of overcoming these problems but present new difficulties in their application and interpretation that will require a concerted effort on the part of the analysis community.

Professor Gary Shiffman: Economic Analysis and Unrestricted Warfare

Professor Gary Shiffman from Georgetown University gave the final presentation. Arguing that economic analysis offers a powerful tool for the study of and application to unrestricted warfare, Dr. Shiffman focused on two key economic concepts: the Individual, who is assumed to act in his own best interest, and the Institution, which imposes constraints on individuals. Dr. Shiffman showed how the behavior of rulers as diverse as Fidel Castro, Saddam Hussein, Usama bin Laden, Kim Jung Il, and the leaders of the Peoples Republic of China can be understood from an economic perspective.

"Analysts can no longer afford to ignore qualitative factors such as the effects of human interaction and reasoning."

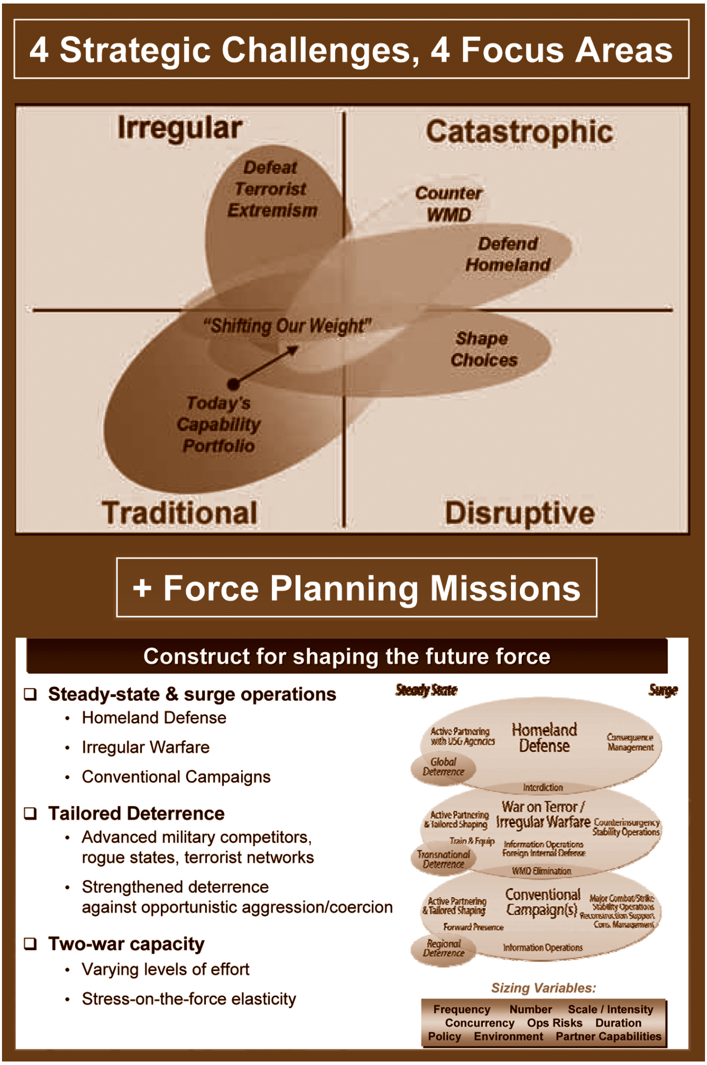
4.2 ASSESSING IRREGULAR WARFARE

Timothy Bright

INTRODUCTION

The Irregular Warfare Division was established by the Director of PA&E last fall. The context for the establishment of my office was the QDR [Quadrennial Defense Review], finished early last spring, which set forth several key strategic guidance precepts for strategic challenges (including irregular challenges) and four focus areas in which the Department of Defense should be building additional capabilities (Figure 1). Defeating terrorist extremism is one of the focus areas that falls squarely in the irregular warfare quadrant. In addition to the strategic challenges and the focus areas identified by the QDR, we have a new force planning construct for force planning missions; and irregular warfare capabilities occupies a new importance in sizing and shaping forces in the future. My division focuses on arraying our talents across PA&E and trying to advance these objectives.

Timothy E. Bright, Director of the Irregular Warfare Division PA&E Office of the Secretary of Defense, is responsible for leading evaluations of a broad spectrum of defense program and budget issues. Mr. Bright previously served as the director of PA&E's Regional Assessment and Modeling Division; Assistant to the Director of PA&E; and as an operations research analyst in the Projection Forces and Land Forces divisions. He has earned the Secretary of Defense Medal for Exceptional Civilian Service, the Office of the Secretary of Defense Award for Excellence, and the Joint Meritorious Unit Award. Mr. Bright has a Bachelor of Science degree from Virginia Polytechnic Institute and State University and a Master's of Public Administration from Syracuse University.



4 Strategic Challenges, 4 Focus Areas

+ Force Planning Missions

Construct for shaping the future force

- ❑ **Steady-state & surge operations**
  - Homeland Defense
  - Irregular Warfare
  - Conventional Campaigns
- ❑ **Tailored Deterrence**
  - Advanced military competitors, rogue states, terrorist networks
  - Strengthened deterrence against opportunistic aggression/coercion
- ❑ **Two-war capacity**
  - Varying levels of effort
  - Stress-on-the-force elasticity

Steady State
Surge
Active Partnering with USG Agencies
Homeland Defense
Consequence Management
Global Deterrence
Interdiction
Active Partnering & Tailored Shaping
War on Terror / Irregular Warfare
Counterinsurgency Stability Operations
Train & Equip
Information Operations Foreign Internal Defense
Transnational Deterrence
WMD Elimination
Active Partnering & Tailored Shaping
Conventional Campaign(s)
Major Combat/Strike Stability Operations Reconstruction Support Cons. Management
Forward Presence
Regional Deterrence
Information Operations

Sizing Variables:

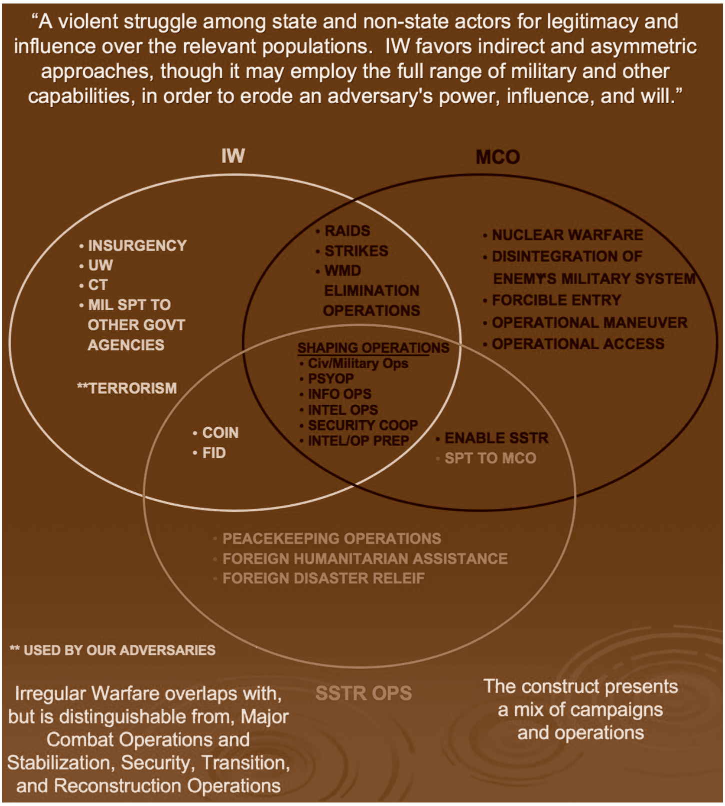
Frequency Number Scale / Intensity
Concurrency Ops Risks Duration
Policy Environment Partner Capabilities

Figure 1 Strategic Guidance

WHAT IS IRREGULAR WARFARE?

How do we think about irregular warfare? In the Department of Defense, we have a new working definition of irregular warfare, as shown in Figure 2. There are three major types of operations: irregular warfare operations; major contingency operations;

and security stabilization, transition, and reconstruction (SSTR) operations. Our irregular warfare capabilities are overlapping; and they largely consist of the global war on terrorism, unrestricted warfare counterinsurgency techniques and operations, training of foreign troops for FID [foreign internal defense] capabilities, and other security assistance activities.


"A violent struggle among state and non-state actors for legitimacy and influence over the relevant populations. IW favors indirect and asymmetric approaches, though it may employ the full range of military and other capabilities, in order to erode an adversary's power, influence, and will."

Irregular Warfare overlaps with, but is distinguishable from, Major Combat Operations and Stabilization, Security, Transition, and Reconstruction Operations

The construct presents a mix of campaigns and operations

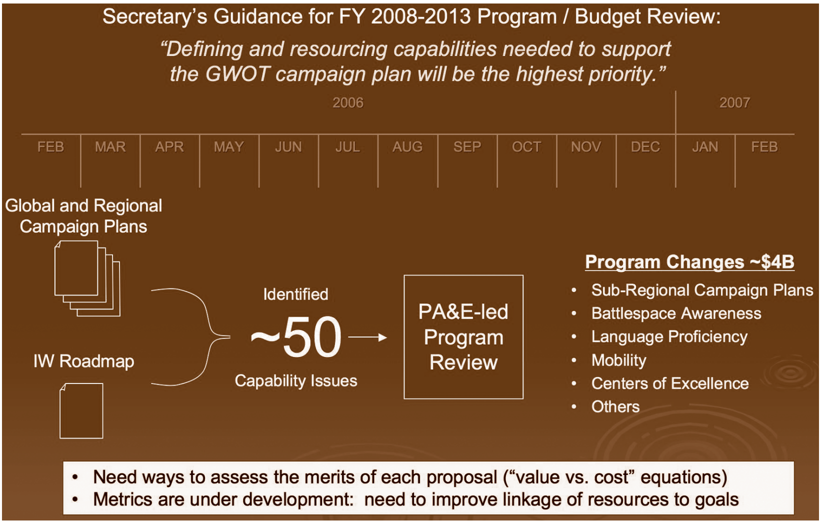
Figure 2 What is Irregular Warfare?

PA&E FOCUS

Those activities really comprise two major efforts. Our work contributes to the development of the Department's future years' expense program, which is the precursor to the annual budget that we submit to the Congress. PA&E's institutional role is to address out-year programming—those four big shifts that we need to undertake in the future years—not current operations or supporting TTPs [tactics, techniques, and procedures] for what we're doing in Iraq or Afghanistan today. Our time horizon is 2008, 2009, and all the way out to 2013 and beyond.

RESOURCING THE GLOBAL WAR ON TERROR (GWOT)

Last year, we conducted an exercise to gain some insight into the capabilities required for irregular warfare. We had clearly been told that GWOT was our highest priority, and we were also searching for high-impact QDR initiatives not addressed in the previous years that we could bring into the baseline budget to resource our GWOT needs. Early in the year, the Deputy Secretary contacted the combatant commanders, who were developing their own subregional campaign plans for GWOT. Other parties, like General Cartwright and TRANSCOM [U.S. Transportation Command], that are also providing supporting capabilities were asked to identify the capabilities they needed to implement their subregional campaign plans for GWOT along with any capability gaps. This inquiry revealed (Figure 3) about 50 individual capability shortfalls.



Secretary's Guidance for FY 2008-2013 Program / Budget Review:

"Defining and resourcing capabilities needed to support the GWOT campaign plan will be the highest priority."

Program Changes ~$4B

- Sub-Regional Campaign Plans
- Battlespace Awareness
- Language Proficiency
- Mobility
- Centers of Excellence
- Others

- Need ways to assess the merits of each proposal ("value vs. cost" equations)
- Metrics are under development: need to improve linkage of resources to goals

Figure 3 Resourcing GWOT

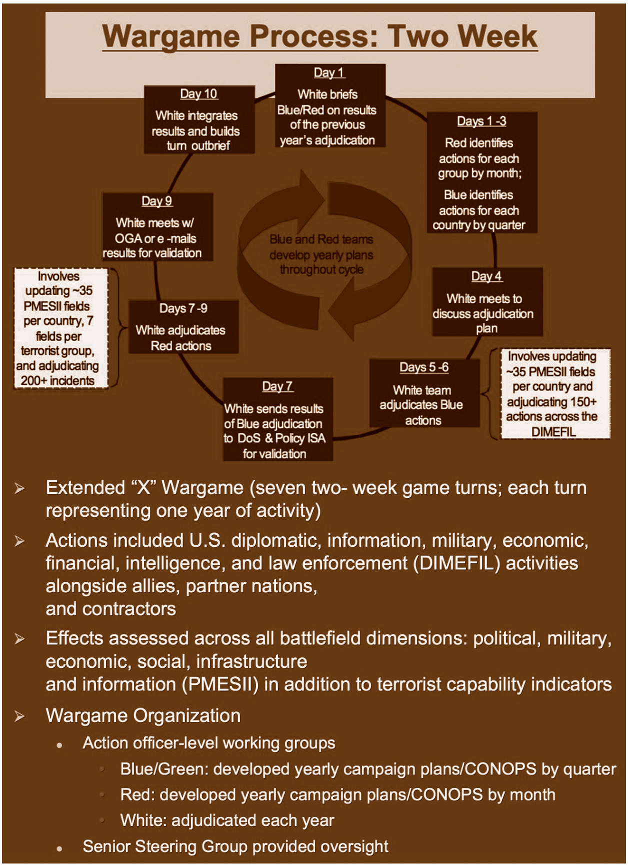
Our responsibility in PA&E was to investigate and understand the issues surrounding those 50 shortfalls. In many cases, as General Cartwright indicated, not only were the gaps revealed, but specific solutions were identified. Then, we asked ourselves if there was any other way to satisfy the shortfall other than through what the combatant commanders were seeking and if that capability existed in some other aspect of the defense program. Accordingly, we divided those 50 issues among a dozen or so separate issue teams, which were responsible for doing the discovery, packaging the issues, and taking the issues to senior leadership. The senior leadership forum is the Deputy's Advisory Working Group, co-chaired by Secretary Gordon England and Admiral Edmund P. Giambastiani.

Throughout the course of those presentations, senior leadership made a series of decisions, shown on the right-hand side in Figure 3, resulting in about $4 billion in funding directed toward these new GWOT initiatives. Funding was focused not just on the CENTCOM [U.S. Central Command] region but included the subregional campaign plans, such as OEF [Operation Enduring Freedom], trans-Sahara initiative in EUCOM [U.S. European Command] AOR [area of responsibility], PACOM [U.S. Pacific Command] for the Philippines, several SOUTHCOM [U.S. Southern Command] initiatives in the Caribbean area, and the triborder region. The kinds of initiatives that were funded through the course of our year-long review included battle space awareness, language proficiency, mobility, small aircraft to serve the subregional campaign plans, and a center of excellence for the SSTR activities.

GWOT X-Game Methodology and Results

As a result of the exercise, we found that we really needed better ways of linking the effectiveness of these various proposals to our objectives. In many cases, we are finding that subject matter expertise and qualitative assessments are the coin of the realm as opposed to quantitative analyses. We have metrics under development, but we need to continuously improve them.

Last year, PA&E undertook an experimental GWOT wargame to try to identify not only the demands for irregular warfare capabilities in the future but also the capabilities needed to source those demands; i.e., the resources that we would need to have within the Defense program to source the projected demand. Figure 4 shows our methodology. The wargame represents red and blue forces over time representing several different terrorist organizations in a number of countries over a period of about seven years. The red CONOPS [Concept of Operations] varied over time. We tried hard to focus not just on the military aspects but also to assess effects across political dimensions, the military, economic, social, and other aspects.



Wargame Process: Two Week

Day 1
White briefs Blue/Red on results of the previous year's adjudication

Days 1 -3
Red identifies actions for each group by month;
Blue identifies actions for each country by quarter

Day 4
White meets to discuss adjudication plan

Days 5 -6
White team adjudicates Blue actions

Involves updating ~35 PMESII fields per country and adjudicating 150+ actions across the DIMEFIL

Day 7
White sends results of Blue adjudication to DoS & Policy ISA for validation

Days 7 -9
White adjudicates Red actions

Involves updating ~35 PMESII fields per country, 7 fields per terrorist group, and adjudicating 200+ incidents

Day 9
White meets w/ OGA or e -mails results for validation

Day 10
White integrates results and builds turn outbrief

Blue and Red teams develop yearly plans throughout cycle

- Extended "X" Wargame (seven two- week game turns; each turn representing one year of activity)
- Actions included U.S. diplomatic, information, military, economic, financial, intelligence, and law enforcement (DIMEFIL) activities alongside allies, partner nations, and contractors
- Effects assessed across all battlefield dimensions: political, military, economic, social, infrastructure and information (PMESII) in addition to terrorist capability indicators
- Wargame Organization
  - Action officer-level working groups
    - Blue/Green: developed yearly campaign plans/CONOPS by quarter
    - Red: developed yearly campaign plans/CONOPS by month
    - White: adjudicated each year
  - Senior Steering Group provided oversight

Figure 4 GWOT X-Game Methodology

Many of the results were classified, but a common theme throughout the study was the importance of our Special Operations Forces (SOF) and the likely stresses on them in the future (which mirrors the current state of our SOF). They carry out the preponderance of our foreign internal defense missions today—the foreign training mission—and we investigated potential ways of realigning them and their missions. We spent quite a bit of time considering the potential use of general-purpose forces in that capacity. The Marine Corps recently established four military training units that have since migrated into the MARSOC [U.S. Marine Corps Forces Special Operations Command] units. We considered at length the merits of establishing foreign training units within the conventional forces that would be dedicated and specially trained for that particular mission.

KEY ANALYTIC CHALLENGES

As we considered the challenges faced by our office and PA&E in general, we developed a list of key issues that needs to be addressed. One of the issues we are currently wrestling with is how to define "winning" in a nonlinear counterinsurgency. How do we know that we're at the end? How do we devise metrics for issues like psychological operations? These nonlinear issues don't necessarily have a direct tie to operational or strategic objectives. For example, last week in Iraq, some Marines were explaining to us how they thought they had performed an act of good will on an earlier deployment by distributing soccer balls to the kids in the Fallujah area. In subsequent deployments, they discovered that the children's fathers felt shamed by the gifts because they were unable to give their children these toys. The plan now is for locally recruited and trained police forces to distribute the soccer balls. Establishing that relationship among the Iraqis themselves made the locals feel as though they needed to pay for the soccer balls in kind, and they are starting to deliver more information. We need to think through the metrics. It's not just giving out soccer balls—they have to be given by the right people.

We've spent quite a bit of time today talking about data. That's entirely appropriate. We do not know exactly what data information we need to collect; and we need to do a much better job of identifying the right data, collecting them, and employing them. We have a whole series of nonlinear challenges—multiple sides and parties, each with its own agenda and point of view; and we do not have good ways of evaluating them and assessing the capabilities that we need to address them. In the near term, at least, we may not be able to model the theory of victory for irregular warfare. In the meantime, we are relying on rules of thumb, subject matter expertise, and war games like the one I described.

"Last week in Iraq, some Marines were explaining to us how they thought they had performed an act of good will on an earlier deployment by distributing soccer balls to the kids in the Fallujah area. In subsequent deployments, they discovered that the children's fathers felt shamed by the gifts because they were unable to give their children these toys."

CONCLUSIONS

We have got our job cut out for us. Our traditional tools are not well suited for the kinds of issues that we are dealing with. It is going to take quite a bit of time for us to acquire the right tools and expertise. In the meantime, we have got to do the best we can and apply the best thinking.

4.3 COMPLEX ADAPTIVE SYSTEMS, MULTIAGENT-BASED MODELS, AND SOME HEURISTICS REGARDING THEIR APPLICABILITY TO URW

Andy Ilachinski

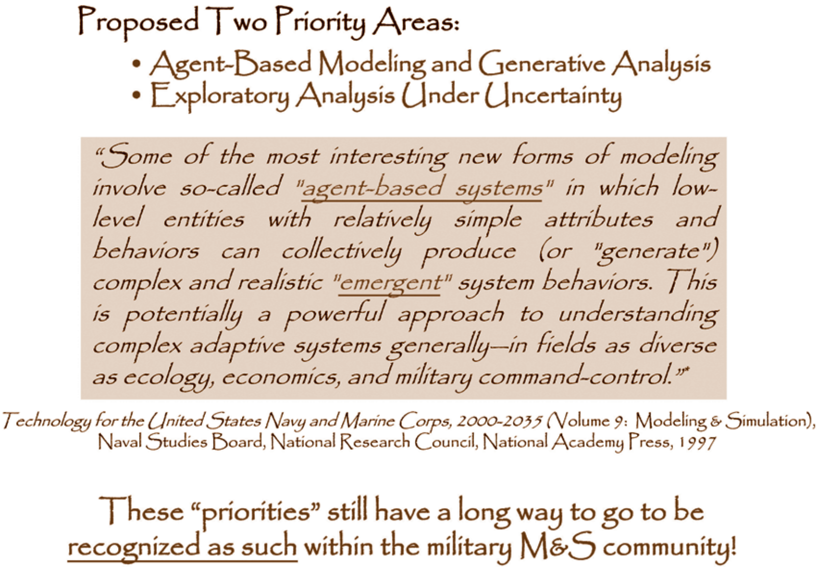
INTRODUCTION

Just as World War II provided ample opportunities for analysis and complex systems theory in the context of the search for German U-boats, now is the time for complex systems theory to play a prominent role in military operations research applicable to unrestricted warfare and the war on terrorism. Many tools from complex systems theory can help us understand, on a dynamic mathematical level, some of the constraints under which two adversaries are forced to operate. Armed with this understanding, military operations can respond in an agile manner with an ability to predict outcomes.

I am going to discuss complex adaptive systems (CAS) and multiagent-based models (MBMs) and specific models that I have developed—Enhanced ISAAC Neural Simulation Tool (EINSTein) and SOTCAC (Self-Organized Terrorist and Counter-terrorist Adaptive Co-evolutions). EINSTein is an agent-based model for land combat that has about a thousand registered users worldwide; 40% of whom, interestingly, are from China, South Korea, and Japan.

Dr. Andy Ilachinski is a senior research analyst and project director at the Center for Naval Analyses (CNA). His work has focused on mathematical modeling and computer simulation studies, search theory, radar modeling, electronic intelligence management, and ambiguity resolution problems. Recently, he has developed two new and widely used, multiagent-based modeling toolkits (ISAAC and EINSTein) to explore self-organized emergent behavior in land combat and of adaptive (terrorist/social) networks. Dr. Ilachinski has authored Artificial War: Multiagent-based Simulation of Combat, Cellular Automata: A Discrete Universe, and Artificial Life Models in Software.

To begin, I will go back to 1997 and to the National Research Council effort on the future of technology for the United States Navy and Marine Corps. Among the recommendations of the panels were two priority areas for modeling and simulation and how they should be applied in operations research as shown in Figure 1. These 'priorities' still have a long way to go to be recognized as such within the military M&S community. I emphasize that these priorities were introduced long before 9/11. I cannot overemphasize the need for multiagent-based tools now.



Proposed Two Priority Areas:

- Agent-Based Modeling and Generative Analysis
- Exploratory Analysis Under Uncertainty

*"Some of the most interesting new forms of modeling involve so-called "agent-based systems" in which low-level entities with relatively simple attributes and behaviors can collectively produce (or "generate") complex and realistic "emergent" system behaviors. This is potentially a powerful approach to understanding complex adaptive systems generally—in fields as diverse as ecology, economics, and military command-control."**

Technology for the United States Navy and Marine Corps, 2000-2035 (Volume 9: Modeling & Simulation), Naval Studies Board, National Research Council, National Academy Press, 1997

These "priorities" still have a long way to go to be recognized as such within the military M&S community!

Figure 1 Naval Studies Board – Panel on Modeling and Simulation (1997)

The left side of Figure 2a illustrates how physicists have traditionally viewed and taught "the physics of" systems. Our models appear simplistic and linear. In fact, if you drill down to some of the low-lying code of some of the most sophisticated DoD models, you will find much traditional physics lurking underneath. Although it may look like it is more complicated on the surface, it not always is.

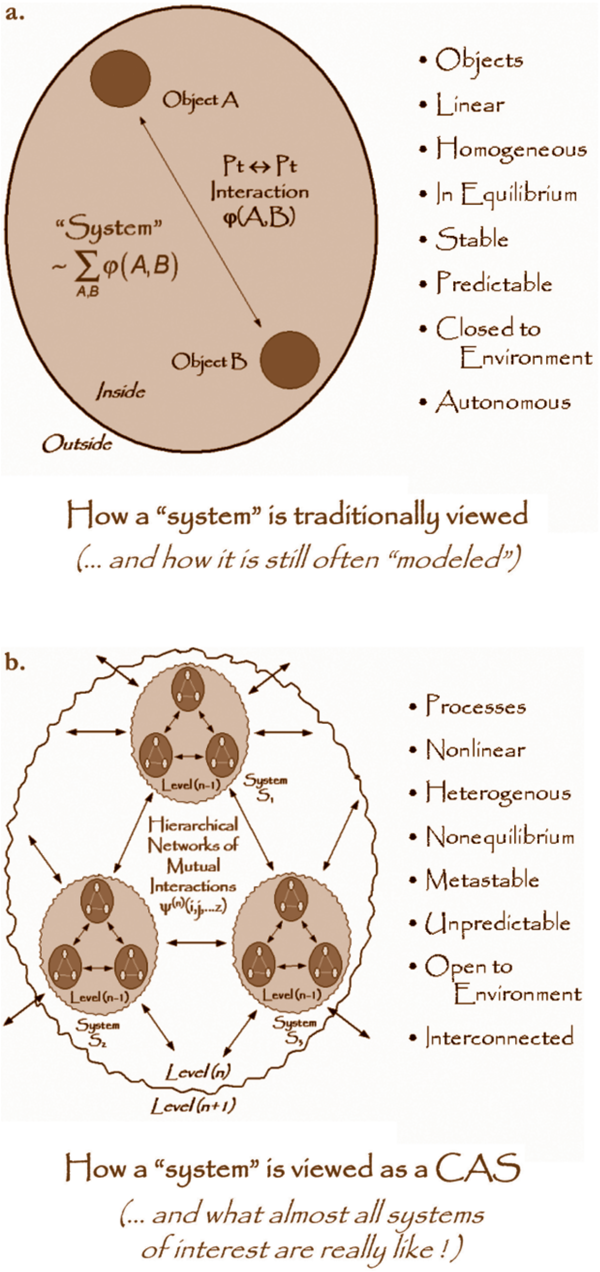


Figure 2 Complex Adaptive Systems (CAS)

Figure 2b comes closer to illustrating what real complex systems are like and contrasts some of the salient features of an adaptive systems complexity to the way systems are viewed in a more conventional light. Obviously, the world is not neatly bundled into things that interact on a point-by-point basis with a clear boundary between an inside and an outside. The real world is messy. Fortunately, there is a burgeoning interdisciplinary field of "complex systems theory" that is studying such systems in earnest. Although the military operations world has been somewhat slow to accept (and slower to exploit) these studies, I am encouraged that it is moving in the right direction. Workshops such as this one testify to that fact!

"The reality of the universe is that things happen because of very complicated interwoven nonlinear causal webs at all scales of time and space."

Physicists and those engaged in traditional analyses typically attempt to solve problems (even profoundly nonlinear ones) by struggling to find the "solution;" the objective is to find some way to express an "answer," all the better if an equation can be found that encapsulates the whole system in a clean closed form. In physicist language, we treat everything as a "mean field." Everything looks and acts like everything else. We do it because it is easy to do and allows us to document it. Unfortunately, it does not describe how the real world acts. So, rather than describing the whole with a static equation, we are left with trying to find visualization tools that allow us to look at very complicated landscapes. These tools allow us to exploit the power of the human brain as a pattern recognizer as Dr. Tether has discussed in the preceding presentation on DARPA. Using 3D visualization, we can rotate what appears to be random so we can see the hypoplanes and regularity pop out. Consequently, it behooves the analytical community to come up with tools, not so much to mimic reality but to capture enough of the essence of it to apply realistic characteristics to models.

Mathematical visualization tools enable us to plot data in a variety of dimensions, revealing patterns. The human brain is remarkably adept at identifying patterns. In many ways, this simple observation lies at the heart of multiagent-based modeling. The challenge is to provide the human brain with a generative storehouse of patterns so that the brain is then tasked with the problem of trying to identify pertinent latent patterns. This is a strong and beautiful departure from traditional analyses and military operations research and why the study of complex systems is inherently important.

There are a number of ways of showing why agent-based modeling is a particularly important tool to use for exploring the behavior of complex adaptive systems. For example, consider a theorem proven by Papadimitrious, Buss, and Tsisiklis back in 1991. Their fundamental theorem (which really ought to be better known, certainly within the military modeling community) appears in a paper called "Unpredictability of Coupled Automata" and goes to the heart of why any dynamical system that contains intertwined local/global dynamics is far from trivial to understand and model. The theorem asserts that, if that global transition rule—within its definition—contains even a single reference to a local state in an individual component of the system, the predictability of the system will be impossible to achieve. A more mathematically precise version reads, "If the global rule space is not constant-free, the system is PSPACE-complete." In practical terms, it means the only way you can predict the future states of the system is to write a multiagent-based simulation of it and execute it! There is no equation you can write that will tell you what the system is doing before it gets there itself. So, there is a fundamental need for a different class of models than we currently use in operations research.

Among many lessons learned in systems modeling, the most useful models are those that support exploratory analyses. The most useful models are those that allow the brain to explore the space of possibilities of what the system can do. Although this is an enormous space of possibilities, I will describe some tools that can help analysts model with qualitative factors, which may be critical drivers of what one is trying to reveal with analysis. Paul Davis (of RAND) has eloquently expressed the need for families of models to get away from scripted behaviors—because the most interesting things to see are those that are unexpected. Once something unexpected happens and is observed, you can apply models to understand why that particular behavior arose. Typically, the simulations that we currently have give you behaviors; but they do not allow you the flexibility of going back to probe the simulation of the system to figure out why you observed a particular behavior.

The movement away from scripted behaviors is based in reality. The reality of the universe is that things happen because of very complicated interwoven nonlinear causal webs at all scales of time and space. That is the nature of a complex system. Our mind on a conscious level is very good at ascertaining linear chains. It is arguable that, on an unconscious level, our brains are even better at discerning much more subtly encoded nonlinear patterns. It is not a given that an analyst who is extremely good at discerning patterns in some space-time series or a physical photographic image will be able to explain or define what those presumed patterns are. It is one thing for an analyst to have the intuition, wisdom, and experience on a conscious level to identify something that is not random; but it is generally much, much harder to articulate that it is so, more importantly, explain why it emerged.

So, how do we build software to model nonlinear patterns? Software agents on a conceptual level are very simple. They really consist of no more than the parts you see here:

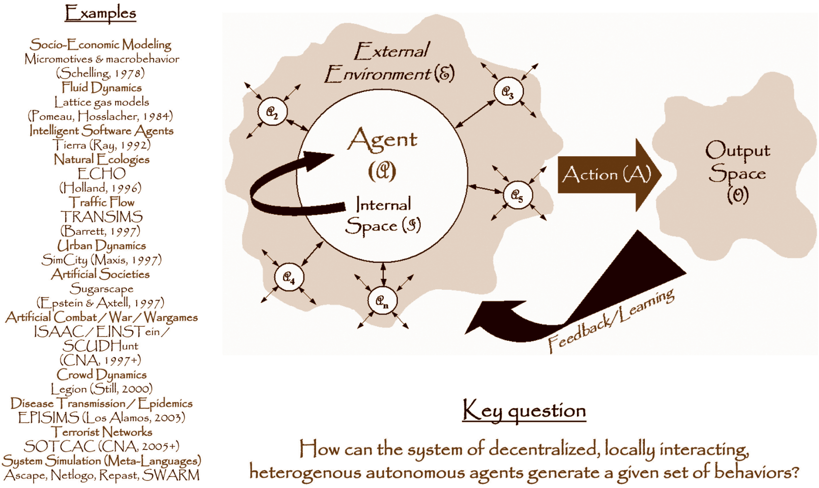
- ***Heterogeneity.*** Agent population contains heterogeneous mix of properties.
- ***Autonomy.*** No central, or top-down, control over individual behavior.
- ***Bounded Rationality.*** Access to local information and finite computational power.
- ***Local Interactions.*** Agents interact only locally with other neighboring agents.

- ***Evolution (+ learning/adaptation).*** Agents evolve and adapt, endogenously over time.
- ***Generative Explanations.*** Analyst/decision-maker is more interested in seeking generative explanations than in "making predictions."
- ***Description and Explanation.*** Fundamental differences exist between description and explanation just as there are fundamental differences between prediction and understanding.

Agents are software components that embody as rich or as simple an internal space as the developer, designer, or modeler deems necessary for the particular problem. They are connected to other agents that are similar in that they have internal properties, but they may be very different. That also lies at the heart of many MBMs. MBMs emphatically do not assume from the start that every part of the system is identical with every other part.

They may be identical only insofar as they have an internal world that partly dictates how they are going to interact with an environment. Beyond that, each agent is going to be different in general from every other. This creates a dynamic environment. Agents are privy only to the local environment that they see. They take actions that impact the environment, and possibly there is a feedback loop that allows the agents to learn either in real time or over time.

Figure 3 provides a lengthy but incomplete list of some of the diverse properties of multiagent-based models that have been applied across a variety of industries from entertainment to economics, to the immune system, and, to the spread of disease. For example, the popular series of games from Maxis, called The Sims, is actually sophisticated agent models. They are deliberately packaged as toys, and they are a lot of fun to play because they mimic quite well the complex dynamics of the systems that they are gaming.



Examples

Socio-Economic Modeling
Micromotives & macrobehavior
(Schelling, 1978)
Fluid Dynamics
Lattice gas models
(Pomeau, Hosslacher, 1984)
Intelligent Software Agents
Tierra (Ray, 1992)
Natural Ecologies
ECHO
(Holland, 1996)
Traffic Flow
TRANSIMS
(Barrett, 1997)
Urban Dynamics
SimCity (Maxis, 1997)
Artificial Societies
Sugarscape
(Epstein & Axtell, 1997)
Artificial Combat / War / Wargames
ISAAC / EINSTein /
SCUDHunt
(CNA, 1997+)
Crowd Dynamics
Legion (Still, 2000)
Disease Transmission / Epidemics
EPISIMS (Los Alamos, 2003)
Terrorist Networks
SOTCAC (CNA, 2005+)
System Simulation (Meta-Languages)
Ascape, Netlogo, Repast, SWARM

Key question

How can the system of decentralized, locally interacting, heterogenous autonomous agents generate a given set of behaviors?

Figure 3 Multiagent-Based Models Employed in Different Industries

Will Wright, the originator of The Sims series of games, is a very gifted modeler. He applied a solution to the key question for all agent-based models—how can a system of decentralized, locally interacting, heterogeneous, and autonomous agents generate a given set of behaviors? Josh Epstein, with the Brookings Institution, and co-developer of the well-known Sugarscape program that uses an agent or agents to model social economics, calls this "generative modeling." Agent-based modeling is predicated on the basic idea that the best answer (or at least an alternative kind of answer compared to what is typically given from more conventional approaches) to why something happens is to "grow" it or to show exactly how it can be generated. Once something interesting is identified and explicitly "generated" in this manner, the results effectively have the strength of a mathematical theorem in the sense that you can backtrack and understand exactly why a certain behavior emerged. When you plot the emergent behavior in some appropriate n-dimensional space (say, to asses an agent's mission readiness which I call the fitness landscape), you can dynamically explore trajectories on the *fitness landscape* to see what alternative possibilities might have ensued.

In the context of unrestricted warfare, if you design an agent world with an appropriate set of characteristics of the players, you have the potential to use an arsenal of tools developed in the complex systems community to deal with precisely these kinds of challenges. Figure 4 lists the agent properties most appropriate for multiagent-based models.

- **Heterogeneity**

  Agents' population contains heterogeneous mix of properties.
- **Autonomy**

  No central, or top-down, control over individual behavior
- **Bounded Rationality**

  Access to local information and finite computational power
- **Local Interactions**

  Agents interact only locally with other neighboring agents.
- **Evolution (+ learning/adaptation)**

  Agents evolve and adapt, endogenously over time.
- **Analyst/decision-maker is more interested in seeking generative explanations than in "making predictions."**

  Fundamental difference between description and explanation (as between prediction and understanding)

Figure 4 Properties of "Systems/Problems" Suitable for MBM Simulations

There is a variety of appropriate uses of multiagent-based models (Figure 5). Fundamentally, a model should be an extension of what the analyst already conceives about a particular problem. This includes all of the latent assumptions, axioms, rules of inference, dynamics, interactions, components, and how they interact. Analysts approach a particular problem with a fairly good idea of what they think the system is doing. Absent a model, analysts will go back to their desks; and they will try to figure out the best they can. Typically, if they are not mathematically trained, they are going to play a series of "what if" scenarios. They will consider the pros and cons, and they will pick a point in one area of the fitness landscape; but they cannot cover all scenarios quickly.

- **As classical simulation tools**
  - Provide dynamic/visual representations of closed-form "solutions"
- **As logical inference engines (for "discovery")**
  - Help identify logical consequences of assumptions/constraints
- **For sensitivity analysis/exploratory analysis**
  - Take excursions away from equilibrium solutions
  - Implicitly characterize the entire solution space
- **As interactive "theorizers"**
  - Provide insights into—and explain—"why" something happens
  - Enhance understanding of existing "problem spaces"
- **As generators of "possibility landscapes"**
  - Generate multiple, alternative "hypotheses"/scenario evolutions
  - Establish deeper links between low-level systems/tactics/assumptions and high-level strategies and operations
- **For suggesting (real-world) experiments**
  - Assist in "discovering" alternative MOEs/MOPs
- **As meta-modeling environments for understanding how existing (or conventional) "family of models" behave and interact**
  - Provide conceptual distillations of model interdependencies

Figure 5 Appropriate Uses of MBMs

So, in addition to extending and augmenting the analysts' knowledge, a model must provide the ability to rapidly sample the space of possibilities. The most important use of multiagent-based models is that they distill the essence of how we think of a particular system, whether it be a terrorist network or a simple activity on a combat battlefield. We encapsulate the distilled essence of how we think the system behaves. It is deliberately kept simple enough so that we can intuit it on a conscious level, and the model then simply executes scenarios much more rapidly than we could have done for ourselves (using pencil and paper).

ISAAC (Irreducible Semi-Autonomous Adaptive Combat) is an early MBM developed about 10 years ago. The follow-on (and vastly enhanced) version, called EINSTein, is a sophisticated and flexible MBM that allows you to play with land combat on a toy level. The EINSTein program was inspired and catalyzed by Lieutenant General Paul VanRiper when he was Commanding General of the Marine Corps Combat Development Center. He is a maverick and a visionary in many ways; and when he came to CNA, he asked a very basic question, "I read all these things about nonlinearity and complexity—is this of any interest to the Marine Corps? Should we be thinking about this?"

That is where the idea that eventually led to EINSTein was born to see if some of the basic ideas of complex systems theory would apply to the dynamics on the combat battlefield. EINSTein is available for download via the Internet and is currently being used around the world in both academic and military analysis. Although popular here at places such as the Naval Postgraduate School, Europe, Australia, and New Zealand, curiously, the registrations reflect that close to 40% of its users come from China, South Korea, and Japan.

EINSTein is really a meta-model that gives analysts the ability to model combat in a variety of ways (Figure 6). Older versions of EINSTein provide a built-in genetic algorithm (which is a heuristic search algorithm for general combinatorial optimization problems) to search for attributes in your agents. A genetic algorithm will search in that enormous space of possibilities for certain behaviors that you specify. So, analysts can play with a variety of tradeoffs.

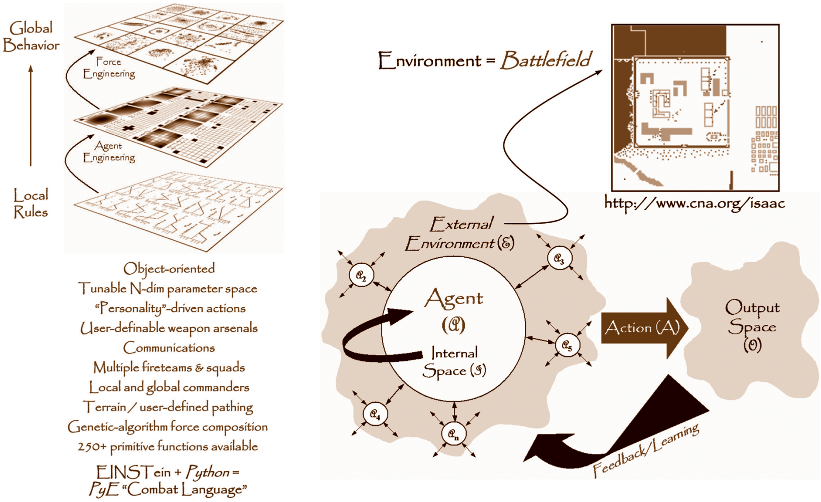

Global Behavior
Force Engineering
Agent Engineering
Local Rules
Object-oriented
Tunable N-dim parameter space
"Personality"-driven actions
User-definable weapon arsenals
Communications
Multiple fireteams & squads
Local and global commanders
Terrain / user-defined pathing
Genetic-algorithm force composition
250+ primitive functions available
EINSTein + Python =
PyE "Combat Language"
Environment = Battlefield
http://www.cna.org/isaac
External Environment (ℰ)
Agent (𝒜)
Internal Space (𝒮)
Action (A)
Output Space (𝒪)
Feedback/Learning

Figure 6 CAS/MBM Example No. 1: Combat Agents (EINSTein)

Suppose in a model combat situation, I equip one side of the adversarial force (A) with a capability, manpower, firepower, and a sophisticated targeting logic, which make this force intelligent. The opposing force (B) may be defined with more or less capability, manpower, firepower, and sophisticated targeting logic. Now, you can add a genetic algorithm to pose the question, "Is there anything in force (B) that will enable it to access resources or change itself to adapt and compensate for its lack of capability?"

Figure 7 illustrates a schematic within EINSTein of how you define and engineer certain mid-level behaviors of individual agents. The middle tier is a map of how agents will behave when they interact as small groups, and the larger patterns that emerge on the topmost level are very important. That circle inside the red square indicated with an arrow, represents one force encircling another. I remember when I gave my first talk that unveiled EINSTein's precursor, ISAAC, to an audience of young lieutenants at Quantico. There was an audible gasp from the audience when they spotted this encircling behavior because I had defined the agent behavior rules, and there was no rule that one force would encircle the other. How did the model know how to do that? The encircling pattern is an emergent behavior. It is precisely what you see if you stand back far enough and look at the system from a bird's eye perspective. We must appreciate that the pattern emerges because of low-level rules interacting in a nonlinear web of interactions. Although the agents appear to be top-down coordinated, the real explanation happens on a much lower level; and it critically depends on this nonlinear web of interactions.

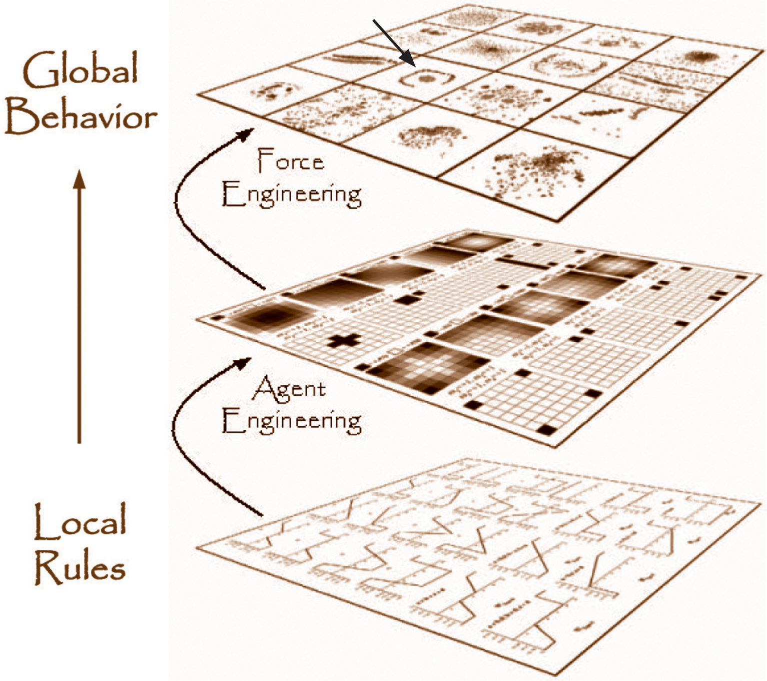


Figure 7 CAS/MBM Example No. 1: Levels of Combat Agent Behavior (EINSTein)

EINSTein is still in development although in recent years, it has been targeted toward specific study groups. The version of EINSTein that is available on the web (http://www.cna.org/isaac/PyE_setup.htm) is a very flexible system with more than 250 primitive functions that are available to the programmer. In fact, for those of you who are programming savvy, it is now combined with a public domain scripting language called Python, which essentially provides the source code level functions to define an MBM for any system, be it ecology, economics, or public health.

EINSTein captures a distilled essence of a complex adaptive system. Therefore, a modeling program like EINSTein may be used to model other complex systems like terrorist networks, which pose a profoundly more difficult challenge because they operate within more complex spaces. EINSTein still takes place in a single, physical space. Terrorist networks operate in a physical space, an information space, a social space, and a virtual space. The virtual space is the counterterrorist belief space of what the good guys think the bad guys are really doing. These added spaces pose far more complex possibilities for the programmer—difficult, but not impossible. Consequently, the Office of Naval Research has partially funded the development of the self-organized Terrorist, Counter-terror Adaptive Co-evolutions program schematically illustrated in Figure 8. SOTCAC promises to be a powerful tool in helping us meet the challenge underlying this URW. "While nothing is easier than to denounce the evildoer, nothing is more difficult than to understand him," as Dostoyevsky reminds us.

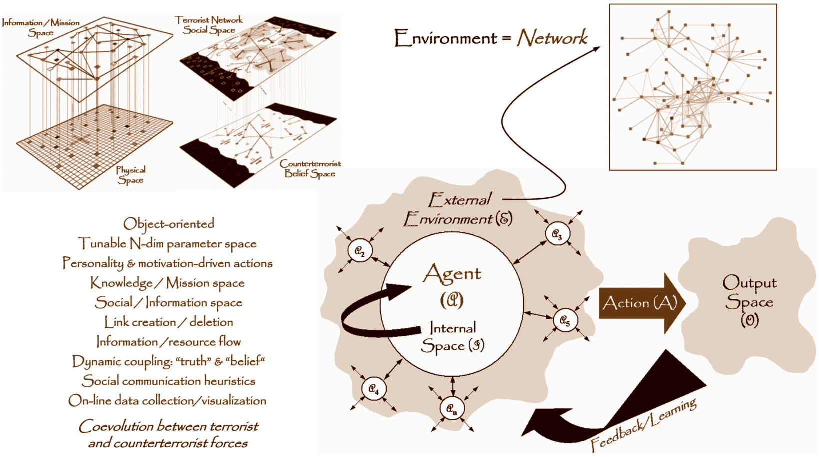

Information / Mission Space
Terrorist Network Social Space
Physical Space
Counterterrorist Belief Space
Environment = Network
Object-oriented
Tunable N-dim parameter space
Personality & motivation-driven actions
Knowledge / Mission space
Social / Information space
Link creation / deletion
Information / resource flow
Dynamic coupling: "truth" & "belief"
Social communication heuristics
On-line data collection/visualization
Coevolution between terrorist and counterterrorist forces
External Environment (ℰ)
Agent (𝒜)
Internal Space (𝒮)
𝒜2
𝒜3
𝒜4
𝒜5
𝒜n
Action (A)
Output Space (𝒪)
Feedback/Learning

Figure 8 CAS/MBM Example No. 2: SOTCAC Behavior Model

Specifically, I have designed SOTCAC to focus attention not on what a terrorist network looks like, or even what a counterterrorist force is doing, but how they are mutually coevolving. Imagine if you will, on a conceptual level, an n-dimensional super space of all possible terrorist and counterterrorist coevolutions. Figure 9 illustrates this concept and includes a timeline that represents the terrorists' perception of their fitness, where the bottom is least fit and the top is most mission-capable.

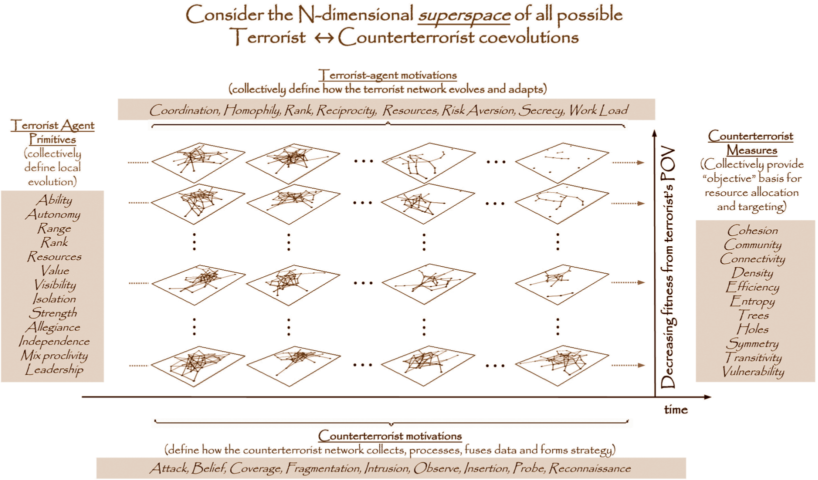

Consider the N-dimensional superspace of all possible
Terrorist ↔ Counterterrorist coevolutions
Terrorist-agent motivations
(collectively define how the terrorist network evolves and adapts)
Coordination, Homophily, Rank, Reciprocity, Resources, Risk Aversion, Secrecy, Work Load
Terrorist Agent Primitives
(collectively define local evolution)
Ability
Autonomy
Range
Rank
Resources
Value
Visibility
Isolation
Strength
Allegiance
Independence
Mix proclivity
Leadership
Decreasing fitness from terrorist's POV
time
Counterterrorist Measures
(Collectively provide "objective" basis for resource allocation and targeting)
Cohesion
Community
Connectivity
Density
Efficiency
Entropy
Trees
Holes
Symmetry
Transitivity
Vulnerability
Counterterrorist motivations
(define how the counterterrorist network collects, processes, fuses data and forms strategy)
Attack, Belief, Coverage, Fragmentation, Intrusion, Observe, Insertion, Probe, Reconnaissance

Figure 9 CAS/MBM SOTAC Terror and Counterterrorist Co-evolutions

As in EINSTein, everything at the agent level is deliberately kept simple. Agents see and react only to their local environment. In Figure 9, the agents do not have access to global information although that is one of the aspects that can be manipulated. Again, keeping the agent activity very simple, they tend to move in one direction as opposed to another. They want to target a particular enemy as opposed to another. They like to cluster with certain squad mates and perhaps not others. They are either obedient to their local commander, or they are not.

I have also developed agent actions that are intuitive so when analysts see a pattern emerge, they can drill down and see exactly what assumption or behavior properties define that particular agent. SOTCAC uses a richer pallet of primitive behaviors, but the program is flexible and can be used in as simple or complete a manner as an analyst desires. In this way, an analyst can reproduce realistic scenarios fairly accurately.

Figure 10 illustrates a wider variety of parameters that defines how local agents evolve locally. A similar thing takes place on the counterterrorist side. You can define a variety of parameters for how counterterrorists think about what they should be doing (e.g., how they probe for information and which particular nodes or links they attack and for what reason). They can also employ a variety of primitive measures.

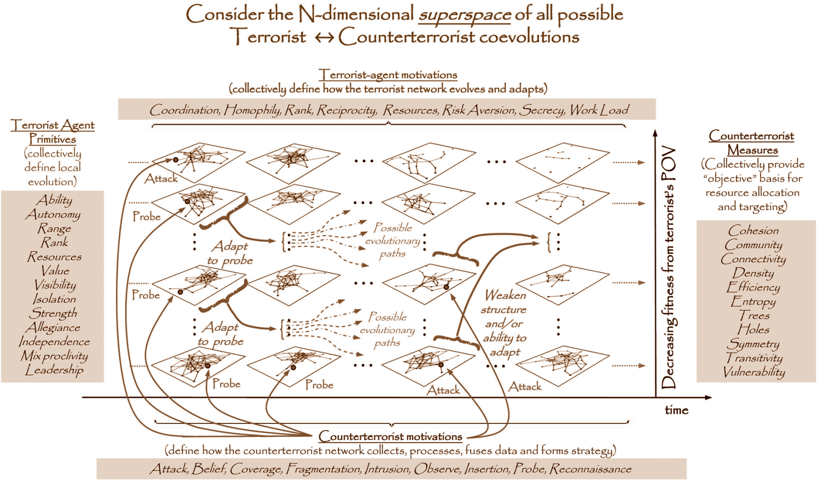

Consider the N-dimensional superspace of all possible
Terrorist ↔ Counterterrorist coevolutions
Terrorist-agent motivations
(collectively define how the terrorist network evolves and adapts)
Coordination, Homophily, Rank, Reciprocity, Resources, Risk Aversion, Secrecy, Work Load
Terrorist Agent Primitives
(collectively define local evolution)
Ability
Autonomy
Range
Rank
Resources
Value
Visibility
Isolation
Strength
Allegiance
Independence
Mix proclivity
Leadership
Attack
Probe
Adapt to probe
Possible evolutionary paths
Probe
Adapt to probe
Possible evolutionary paths
Weaken structure and/or ability to adapt
Probe
Probe
Attack
Attack
Decreasing fitness from terrorist's POV
time
Counterterrorist Measures
(Collectively provide "objective" basis for resource allocation and targeting)
Cohesion
Community
Connectivity
Density
Efficiency
Entropy
Trees
Holes
Symmetry
Transitivity
Vulnerability
Counterterrorist motivations
(define how the counterterrorist network collects, processes, fuses data and forms strategy)
Attack, Belief, Coverage, Fragmentation, Intrusion, Observe, Insertion, Probe, Reconnaissance

Figure 10 CAS/MBM SOTCAC Terror and Counterterrorist Co-evolutions

Again, the model is designed so that there are no clear-cut answers. It simply gives analysts a playing field for an extended series of "what if" scenarios. What if I endow my counterterrorist force with a new capability? What if I assume the terrorist network is engaged in a specific activity? Based on these parameters, an analyst can drill down and probe the system to model counterterrorist adaptations or calibrate agent definitions. SOTCAC has been developed with placeholders to enable analysts to represent particular groups of terrorists and define an adversary or scenario using real-world data.

Figure 11 shows SOTCAC in the context of trying to prevent a terrorist network from becoming mission ready and progressing into the area of high fitness or a counterterrorist system trying to push the entire terrorist network to low fitness.

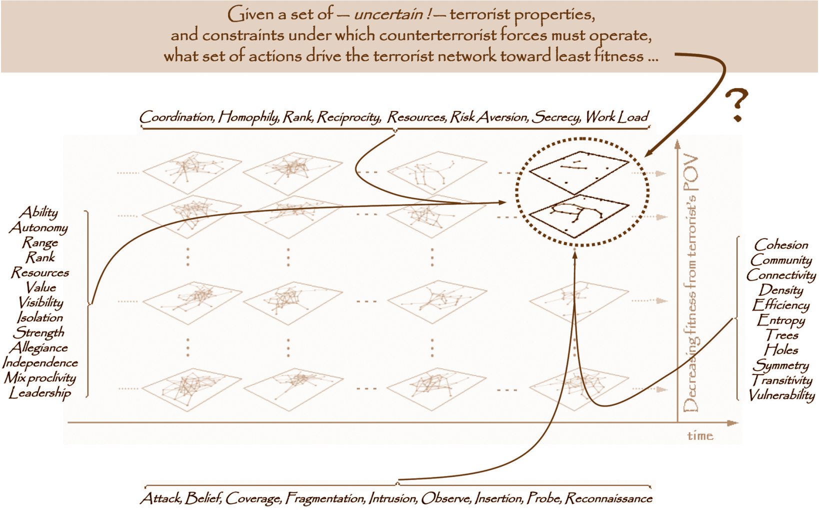

Given a set of — uncertain ! — terrorist properties,
and constraints under which counterterrorist forces must operate,
what set of actions drive the terrorist network toward least fitness ...
?
Coordination, Homophily, Rank, Reciprocity, Resources, Risk Aversion, Secrecy, Work Load
Ability
Autonomy
Range
Rank
Resources
Value
Visibility
Isolation
Strength
Allegiance
Independence
Mix proclivity
Leadership
Decreasing fitness from terrorist's POV
Cohesion
Community
Connectivity
Density
Efficiency
Entropy
Trees
Holes
Symmetry
Transitivity
Vulnerability
time
Attack, Belief, Coverage, Fragmentation, Intrusion, Observe, Insertion, Probe, Reconnaissance

Figure 11 CAS/MBM SOTCAC Terror Network Coevolutions

CONCLUSIONS

A successful strategy can emerge only by understanding—on a fundamental level—how the set of all possible actions that a counterterrorist organization can take (in all possible contexts) is dynamically related to the set of all possible measures of how well a terrorist network functions. Such an understanding can come about only by systematically exploring the multidimensional space that contains all possible outcomes of terrorist-counterterrorist coevolutions. (Figures 9-11 schematically depict this multidimensional "superspace".) SOTCAC is being developed precisely for this reason.

In general, a complex adaptive network cannot easily be "defeated" by removing a few (or even many) of its pieces; rather, one must find ways to disrupt the adaptive web of nonlinear interactions that sustains and nurtures it.

The first place to begin, as analysts and decision-makers, is with MBMs that respect the innate complexity of the underlying dynamics and develop our intuition about what our new enemy is really like.

4.4 ECONOMIC ANALYSIS AND UNRESTRICTED WARFARE

Gary M. Shiffman

Economic analysis offers two concepts relevant to the study and application of unrestricted warfare: a conception of universal human nature (unchanged by culture and by time) and an appreciation for institutions and the constraints they impose. The fundamental analytical framework I will discuss today derives from the combination of these two concepts.

Institutions don't make decisions—people do. But an individual makes a decision within an institution. Al Qaeda is an institution; Osama bin Laden is a decision-maker. Iraq did not choose to invade Kuwait in 1990; Saddam Hussein chose to invade, and he made his choices within the institutional constraints of the Office of President of Iraq.

Individuals making decisions in conditions of scarcity—this defines economic science and provides the fundamental starting

Dr. Gary M. Shiffman is an adjunct professor at Georgetown University's Security Studies Program in the School of Foreign Service, and he is Senior Fellow at the Center for Peace and Security Studies. In 2006, he published, Economic Instruments of Security Policy: Influencing the Choices of Leaders. Dr. Shiffman also serves as Senior Vice President for Global and Homeland Security at L-3 Communications, Inc. He focuses his work on homeland security and emergency management, counter-insurgency, and intelligence issues. He has served the DHS as Chief of Staff, U.S. Customs and Border Protection, and the U.S. Senate as a Senior Policy Advisor. Dr. Shiffman, a decorated Gulf War veteran, has also worked on international law and U.S. antiterrorism policies.

point for the study of unrestricted warfare. The individual decision-maker and the institutional constraints—these two elements compose the building blocks for economic analysis applied to unrestricted warfare.

THE INDIVIDUAL

> *It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages.*
>
> *— Adam Smith*[1]

The above quote from Adam Smith dates back about 230 years. Although it still makes sense today, you may be wondering what does it have to do with unrestricted warfare? Smith's contribution is simply this: the best way to get what you want from someone is to offer them what they want.

We know this is true intuitively; and believe it or not, this is the fundamental basis of economic science. We know that people maximize. What each of us maximizes differs from person to person. Our preferences are not the same—mine are not the same as yours. A common error in summarizing economic analysis is that "it is about money." I ask each of you to think about your last paycheck. How many of you consider yourselves to be earning money for the sake of the money? With your money, you consumed, you saved, and you paid taxes.

1. You consumed things that you preferred to money; if you didn't prefer the things you bought to the money you had, you would not have bought them. This defines all voluntary trade.

2. You saved—which is to say you put off today's consumption for tomorrow's consumption. Stated another way, your savings dollars today are tomorrow's consumption dollars. For me,

[1] Smith, Adam, WN: B.I, Ch. 2, Of the Principle which gives Occasion to the Division of Labour in paragraph I.2.2

> I save for my retirement so that my wife and I can live and not work at a certain point in our lives. I also save for our kids' educations. I also save for a renovation to my house in 2008 and our upcoming summer vacation. My point here is that I am not earning money so that I can have the money. I have highlighted several things I am maximizing, and they are facilitated by money but I don't maximize money.

That each of us chooses to maximize something is, in fact, a universal trait. It applies to all people around the world; and it applies to all people throughout history. It applies to George W. Bush and to Kim Jong Il; it applies to Osama bin Laden, Mahmoud Ahmadinejad, and Tony Blair.

This simple truth gives analysts and policymakers a very powerful tool. If I assume Kim Jong Il sane and rational—a requirement of this analytical tool—then I can begin to understand his individual observable behaviors. If successful, I can then model and predict future behaviors. And ultimately, I can craft and evaluate policies directed toward him with the purpose of advancing my objectives. By addressing the autocrat's self-interest, I can begin to get to mine.

But self-interest does not tell the entire story. We need to understand the institutions that constrain the decision-maker.

THE INSTITUTIONS

To discuss institutions, I point you toward Douglass North.

> *Institutions are the humanly devised constraints that structure human interaction. They are made up of formal constraints (e.g., rules, laws, constitutions), informal constraints (e.g., norms of behavior, conventions, self-imposed codes of conduct), and their enforcement characteristics.*

> *Together they define the incentive structure of societies and specifically economies.*
>
> *— Douglass North*[2]

This quote, from his Nobel speech in 1993, sheds interesting light on the economic analyst's views of what a recent conference organizer called unrestricted warfare:

> *The first rule of unrestricted warfare is that there are no rules; nothing is forbidden.*[3]

I understand the context in which people offer this definition, but comparing it to North's provides a good opportunity for contrasts. Institutions include rules and norms, both formal and informal, and their enforcement mechanisms. Autocrats and democrats alike make maximizing decisions within some rule-based structure. Even the most extreme autocrat—provided he is rational and sane—maximizes something. And by seeking something, he will face some rules and norms. The extreme case to make this point—taped beheadings in Iraq—ended not because Coalition forces killed those responsible. The taped beheadings stopped because they violated the acceptable standard, although informal, of those the terrorists relied upon for support and legitimacy.

Self-interested terrorists had to stop the beheadings—they found these acts forbidden, given their desire to win popular support.

Because institutions are the man-made rules that govern behavior, even so-called unrestricted warfare has rules. The President of the United States faces constraints. The insurgent leader faces constraints. The criminal faces constraints. The terrorist faces constraints.

[2] North, Douglass, "Lecture to the memory of Alfred Nobel," December 9, 1993.

[3] "The first rule of unrestricted warfare is that there are no rules; nothing is forbidden. Unrestricted warfare employs surprise and deception and uses both civilian technology and military weapons to break the opponent's will. " March 20-21, 2007. JHU/APL, Combating the Unrestricted Warfare Threat: Integrating Strategy, Analysis, and Technology. See http://www.jhuapl.edu/urw_symposium/

APPLICATION OF ECONOMIC ANALYSIS TO UNRESTRICTED WARFARE

I suggest that our challenge—applying economic analysis to unrestricted warfare—is threefold. First, we must seek to understand what the "bad guys" want to maximize. Second, we must seek to understand their institutional constraints. And only then do we attempt to evaluate past and future policies by their ability to accomplish one of two tasks. First, does the policy further constrain their actions that we find counter to our interests; and second, does the policy encourage actions consistent with our interests?

Analytical Framework

1. **understand what the individual seeks,**
2. **understand the relevant institutional constraints**
3. **evaluate policies**
   a. **further constrain negative behavior?**
   b. **encourage positive behavior?**

A person chooses violence when he or she perceives the violent option to be the best available option. He or she chooses violence when the next best nonviolent alternative appears inferior; i.e., a less preferred option. Going back to Adam Smith, the baker gets up early in the morning and bakes breads all day, not because he wants us to eat well, but because he wants to eat well and feed his family. He wants the best for himself so he bakes bread for us.

The terrorist will choose violent acts against Americans when violence presents the best available option to maximize his self-interest given the constraints he faces. U.S. policies toward the terrorist, therefore, must impose further constraints or provide incentives so that the violent acts become less preferable to other actions. We must "bake" something that they will buy—something they will prefer; otherwise, we must constrain their decision-making abilities so that we restrict their ability to buy what hurts our interest.

Cuba

Fidel Castro's behavior over the past 14 years indicates that he seeks to stay in power and keep his "revolution" going forever. Until the early 1990s, Castro received the Soviet Union's largest subsidy. Since 1993, however, he has had to keep power without the subsidy, with a struggling economy, and without having political legitimacy from elections. He has been facing legitimacy issues. By observing his behavior over the past 14 years, we see that he has vacillated in his handling of the economy—at some times, allowing for private property ownership and at other times, undermining property rights. He has sought economic wealth from freer trade but has feared losing his relative power over the people of Cuba. Given these goals and constraints, we can conclude that the Cuban economy has operated at Fidel Castro's optimum level over the past 14 years.

Did U.S. policies toward Castro impact his behavior over the 1990s? The U.S. has sought economic and political liberalization in Cuba. During the 1990s, Castro did not liberalize the polity and he killed four Americans in an unarmed aircraft in the Florida Straits. U.S. policies, primarily unilateral economic sanctions, had no economic impact on Cuba.[4] They did not prevent Castro from acquiring any particular things or deny him particular sources of revenue. The sanctions, therefore, did not likely alter his behavior either to the negative or the positive. It may be worth noting that the sanctions did provide both Castro and many U.S. political leaders with symbolic victories of sorts. Castro was able to employ war-like rhetoric in describing the United States; U.S. Presidents and congressional leaders also were able to claim political victory by not taking part in any trade with the Cuban dictator.

[4] See Shiffman, Gary. 2006. *Economic Instruments of Security Policy: Influencing the Choices of Leaders*. Palgrave Macmillan. Also Shiffman 2002, "Castro's Choices."

Empirically, we can see that U.S. policies toward Cuba have not led Castro toward liberalization. It would appear that the analytical framework throws new light on the Cuban case study.

Iraq

Also during the 1990s, while the U.S. had unilateral sanctions imposed upon Castro's Cuba, we took part in multilateral sanctions against Saddam Hussein's Iraq. Based upon his exhibited behavior, Saddam sought to stay in power and maximize his power. He certainly had the ability to steal more money and then escape the country; but instead, he spent a great deal of money improving his ability to remain in power. He spent on loyalty and repression.

Following the Gulf War of 1990-1991, however, the international community imposed sanctions on Iraq—sanctions that did, in fact, deny specific items and levels of economic activity to the leader. Unilateral sanctions did alter the constraints the dictator faced and had the opportunity to alter his behavior. Over time, however, the Oil-for-Food program mitigated any economic impact on Saddam; and therefore, our ability to alter his behavior diminished.

U.S. policy toward Iraq evolved over the past decade, from regime change to liberalization to containment, and back again. Did our policies ever match our goals? Did we restrict Saddam's actions? Yes, during the 1990-1991 Gulf War, during the tight multilateral sanctions. Did we provide him incentives to take actions consistent with our interests under the Oil-for-Food program? Probably not.

People's Republic of China

One more example from the recent past, the People's Republic of China, was the subject of much U.S. policymaking during the 1990s. The debates in the U.S. centered on the question of "normal trade" with the leaders in Beijing.

The arguments were divided into two basic sides. The U.S. business community argued that trade would impact the general populations in China with minimal direct benefit in Beijing.

By having a direct influence on the Chinese people, U.S. employees operating in China would compose a legion of U.S. ambassadors to improve person-to-person bilateral relations and show a generation of Chinese citizens the meaning of political and economic freedom.

The human rights community, however, argued that the trade with China would, in fact, legitimize the autocrats in Beijing and allow them to increase their legitimacy and their hold on power. It was argued that U.S. normalizing trade with China would demonstrate to the world that the American people did not care about the treatment of the human rights activists killed during the Tiananmen Square massacre of 1989, the Dalai Lama of Tibet, or the countless other human rights violations well documented in the State Department's annual reports.

This dynamic, while actively debated, produced some progress on the human rights agenda, including the release of prominent political prisoners in China each year as the annual Most Favored Nation debate neared. In the U.S., however, even our political leaders face constraints; and the U.S. did abolish the annual debate and granted "normal trading" status to the PRC. Since this policy, the economic relationship has improved, as many in the business community predicted. However, no significant progress on human rights in China has been reported.

In this example, the Chinese leaders wanted to maintain political control of the country and yet allow for economic openness. The human rights debates interfered with this agenda, and the leaders would take action each year to ameliorate some human rights concerns. The U.S. policy provided an incentive for the Beijing leadership to give the U.S. human rights community something it wanted, progress on its agenda, in exchange for the U.S. giving Beijing something China's leaders wanted, an annual extension of Most Favored Nation status. Once the annual debate over MFN ended, the annual quid-pro-quo also ended. With nothing being offered to Beijing, Beijing offered nothing back.

Al Qaeda

Looking at today's challenges, I will highlight the global counter-insurgency being led by Osama bin Laden (UBL). If we want UBL to change his behavior, we need to understand that he is self-interested and that he faces constraints.

Some economists are doing interesting work on insurgency and terrorism. I will highlight just a few stylized facts and refer you to the bibliography for more information.

Center versus Periphery

First, we must disaggregate the actors. In this literature, we can distinguish between the center and the periphery. As Castro is at the center in Cuba and the Cuban people the periphery, we can disaggregate the al Qaeda organization into UBL in the "center" and his followers and foot soldiers in the "periphery."

Frontiers of Research

We can think of terrorism as taking place in a marketplace. If there is information, the assignment of property rights, and enforcement mechanisms, people will make self-maximizing decisions. So, why would people choose violence?

Greed versus Grievance; Ideology or Power? What is the self-interested terrorist trying to maximize in the global insurgency? In the simplest terms, is it greed or grievance? Is he maximizing wealth, or is he seeking justice? Is he maximizing power, or is he fighting for people's souls?

Biology. People will fight for their survival and also the survival and success of future generations.

Hatred. People may be more inclined toward violence as a result of hate-creating stories. Research by Edward Glaeser of Harvard looked at people's willingness to accept hate-creating stories and argued that, at times, the cost of accepting hate-creating stories is lower than the cost of learning the truth.

Reward versus Punishment. If the first goal of anti-terrorism efforts is to deter the act before it is ever attempted, the seminal

1968 Gary Becker work on crime and punishment must inform our policymaking. In short, Becker instructs us to address two variables: the probability of failure and the consequences of failure. Where possible, we must create policies to manipulate these two variables to deter acts of violence.

Spectacle. Tyler Cowen identifies "spectacle" as the possible goal of the terrorist. This might explain why there have been no more terrorist attacks in the U.S. since 2001—because the goal is not simply to kill people but to create a spectacle. And this is not easy to do. If we believe that "spectacle" is actually the desired outcome, we can prioritize the allocation of resources to appropriate policies.

"Club Goods." Fascinating work by Larry Iannaccone, Eli Berman, and David Laitin addresses, among other things, the rationality of suicide terrorism with a theory of "club goods" associated with extremism. When the benefits of "club" membership exceed the costs of non-membership and the "club" requires violent acts or the possibility of violent acts as a requirement to entry, we can understand suicide terrorism.

Policies

Given this analysis of the decision-maker, how do we impact his behavior? U.S. policy is to protect the American people from acts of terrorism. Our policies, to the extent that they impose constraints on Osama bin Laden, can impact his behavior. I cannot prove to you why there have been no attacks in the U.S. since 9/11, but I can argue where our policies may have been most successful based upon economic analysis.

If you divide the world into people and things, any production requires some combination. Bin Laden requires both to produce insurgent actions. Our policies may have significantly accomplished the following:

- By killing and capturing al Qaeda leaders around the world and disrupting planning cells, we have denied him access to people—his human capital.
  - I do not know if we have impacted his ability to recruit—it must surely be our goal.
- Our efforts to prosecute the war around the world have denied him safe havens from which to operate.
- Our efforts to cut off terrorist financing may have impacted his ability to raise capital.
- Our homeland security efforts have made terrorist acts more expensive
  - to get access to U.S. territory
  - to get access to weapons
  - to damage our critical infrastructure due to Critical Infrastructure Protection and Preparedness efforts.

Enforcement

If we shrink an adversary's budget and increase his costs, we will certainly impact his ability to harm our domestic population. But what if we want to offer him something? One final analytical point: North's definition of an institution includes "enforcement characteristics." Specifically, any voluntary action requires three elements:

1. Property rights
2. Information
3. Enforcement

Let's look at Kim Jong Il and nuclear program negotiations to understand the challenges of offering an autocrat a bargain. Based upon the economic analysis described above, we know that challenges and opportunities arise from human nature.

Opportunity: We can know or seek to know what it is that Kim seeks.

Challenge: How do we enforce the deal?

If we look back to the Agreed Framework of the 1990s, we can see that the failure of this policy stems from the challenges with information and enforcement. And economic science tells us that both are required for a functioning market transaction—a voluntary trade between the U.S. and DPRK leadership.

CONCLUSION

Adam Smith advised us not to rely on the benevolence of the baker for our bread but to rely on the baker's own self-interest.

> *Whoever offers to another a bargain of any kind, proposes to do this. Give me that which I want, and you shall have this which you want, is the meaning of every such offer; and it is in this manner that we obtain from one another the far greater part of those good offices which we stand in need of.* [5]

To paraphrase Adam Smith, it is not from the benevolence of the criminal, insurgent, or terrorist that we expect our security but from their regard to their own interest. We should address ourselves not to their humanity but to their self-love and never talk to them of our own necessities but of their advantages.

BIBLIOGRAPHY

1. Becker, Gary S., "Crime and Punishment: An Economic Approach," *Journal of Political Economy* 76, No. 2 (March/April 1968): 169-217.

2. Berman, Eli, and David D. Laitin. 2005. "Hard Targets: Evidence on the Tactical Use of Suicide Attacks," December 2006. econ.ucsd.edu/~elib/

3. Berman, Eli, and Laurence R. Iannaccone, "Religious Extremism: the good, the bad and the deadly," Public Choice, 128(1-2), pp. 109-129, (2006).

[5] Smith, Adam, WN: B.I, Ch. 2, Of the Principle which gives Occasion to the Division of Labour in paragraph I.2.2

4. Collier, "Rebellion as a Quasi-Criminal Activity," JCR 2000. Paul Collier, "Rebellion as a Quasi-Criminal Activity. *Journal of Conflict Resolution*, Vol. 44, No. 6, December 2000, pp. 839-853. World Bank.

5. Cowen, Tyler, "Terrorism as Theatre: Analysis and Policy Implications." April 27, 2005. [http://cipp.gmu.edu/archive/Tyler-Cowen-Terrorism-as-Theater.pdf]

6. Gershenson, Dmitriy, and Herschel I. Grossman. "Civil Conflict: Ended or Never Ending?" *Journal of Conflict Resolution*, Vol. 44 No. 6, December 2000, pp. 808-822, © 2000 Sage Publications, Inc.

7. Glaeser, Edward L. 2005. "The Political Economy of Hatred," *Quarterly Journal of Economics* 120(1) pp. 45-86.

8. Hirshleifer, Jack, "The Bioeconomic Causes of War," *Managerial and Decision Economics*, Vol. 19, No. 7/8, Management, Organization and Human Nature. (Nov. - Dec. 1998), pp. 457-466.

9. Iannaccone, Laurence, R., "The Market for Martyrs," December 2003. Presented at the 2004 Meetings of the American Economic Association, San Diego, CA.

10. Shiffman, Gary M. 2006. Economic Instruments of Security Policy: Influencing the Choices of Leaders. Palgrave Macmillan. www.economicinstruments.org.

11. Shiffman, Gary M., "Castro's Choices: The Economics of Economic Sanctions." Cuba in Transition: Volume 12, Papers and Proceedings of the Twelfth Annual Meeting of the Association for the Study of the Cuban Economy (ASCE), August 2002

4.5 QUESTIONS AND ANSWERS HIGHLIGHTS

Transcripts

Q: *The issue of devising metrics seems to be a wide, cross-disciplinary question that may not get answered very well if we approach it in the usual focused ways. Would it be possible to do something similar to the Barclay's system of trying out experimental metrics, but instead of an in-house set of "quants," seeking proposals from across DoD and academia?*

Mr. Timothy Bright – We are, in fact, doing exactly as you suggest. The Department's senior leadership regularly revisits the questions of which metrics have proven useful and which newly proposed ones have promise. This search for improved metrics is, of course, conducted in a way that recognizes the burden placed on our operational forces by requirements for data. One cardinal reality that constrains the effort is that commanders in the field will expend effort on providing data only if they are convinced that it will profit them—that is, improve their operational capabilities—to do so. And they have, as people in combat always have, very high discount rates.

The focus of the analyses I've described is on shaping the future force. The full effects of the analyses will not be realized for years. For example, we are now engaged in analysis of alternatives for distributing the planned increase in our ground forces among various kinds of existing and envisioned units. The resulting decisions will produce a force far better designed for irregular warfare than the legacy Cold-War force with which we began this century. There are, I hasten to add, other analytic efforts directed at the rapid fielding of technologies for meeting immediate and urgent operational needs—for example, for identifying and distributing defenses against improvised explosive devices and for improving the armor for our lighter vehicles. These analyses focus on the adaptation of existing technologies and force elements rather than on the development of new ones.

Q: *Why does it seem to take so long to perform some of the analyses? Some conclusions appear obvious; e.g., language capability.*

Mr. Timothy Bright – The time it takes to get from need to capability has several components: time before the need is recognized or latency, time to do the analysis, time to decide what to do, and time to implement the decision. The analyses I've described today address long-term issues, where the analysis and implementation times tend to be long. In other cases—for example, IED defense—the time is much shorter. In the case of languages, we didn't initially recognize how long we would be in Iraq—in other words, long latency—and fluency takes time to acquire; that is, long implementation.

Q: *To what extent have the models and algorithms that you described influenced national security policy? Are there or will we be seeing products of this analysis on the ground in our current theaters of operation?*

Dr. Andy Ilachinski – As far as the upper echelons of senior U.S. decision-making are concerned, CAS-based thinking and insights derived from agent models—indeed, informed opinion that incorporates the lessons of nonlinear dynamics on any level—are shallow and infrequent at best. In recent years, there has been only a handful of leaders who were (1) knowledgeable enough and (2) impassioned enough about the importance of CAS to make a difference. Two that I've had the great privilege of interacting with are Lt Gen [Ret] Paul van Riper, who was virtually single-handedly responsible for introducing complexity-laden thinking to the USMC; and Vice Admiral [Ret] Arthur K. Cebrowski, the father of network-centric warfare. I should also mention that Dr. William Perry, Secretary of Defense under President Clinton, was a rarity at that level of government in the context of CAS. He has a doctorate in mathematics and has produced several noteworthy technical briefs on certain aspects of nonlinear dynamics. I also briefed USMC Commandants Charles Krulak in 1999 and Michael Hagee in 2005; both showed a strong interest in agent models and subsequently sponsored related work. The CIA has a small cadre of informed analysts and certainly uses analytical techniques derived from complexity, but it is questionable how far up the chain such analyses percolate.

Q: How do you propose bridging the gap between the very technical requirements of constructing the models you describe and the social science metrics required to populate them? How would you explain/sell the results of such a model to the nontechnical decision-maker?

Dr. Andy Ilachinski – There are two questions here, both good ones. First, the technical requirements of agent models exist to ensure that whatever outcomes emerge represent genuinely emergent consequences of the model and are not artifacts of an inconsistent or inappropriate implementation. Assuming the model has been well designed and implemented in code, the issues in calibrating the model ought to be limited to securing the appropriate real-world data and replacing the notional data used in testbed runs. An important part of the design process is ensuring that appropriate placeholders exist within the model to allow the real-world data to be substituted for their imagined in-model counterparts. Assuming the model faithfully captures critical drivers of the real-world system it is designed to simulate, its value—as a logico-deductive engine for providing explanatory insight into the behavior of the real-world system—is, in the final analysis, a function of the veracity of the real-world data used to run it. Second, regarding the communication of model results, in many ways it is a metamodeling issue—that is, it is a problem that plagues all models and is certainly not confined to agent sims. Whether the underlying rules of a model are transparently simple or, in some rare cases, impenetrably incomprehensible, the degree to which the model is useful or can be fathomed at all is almost entirely a function of how its output is visualized and communicated to the user. Naturally, analysts have very different requirements and needs from those of senior decision-makers, who are typically not well versed in the technical aspects of model coding; and appropriate visualization tools must be used in each case.

In the case of EINSTein, which is an agent combat model, the display of notional graphical avatars of real soldiers maneuvering on a computer screen, with accompanying dynamic plots showing values of pertinent statistical parameters that summarize unfolding runs, allows prospective users to both assimilate vast reams of information intuitively, at-a-glance, and equally important, to minimize the details of the complex rules and behaviors that are under the hood, so to speak. The details are all there, of course, and are accessible at any time via either EINSTein's GUI or a programmer on the source code level. But it is precisely the high-level visualization of the macrolevel patterns that emerge out of the underlying rule set that makes EINSTein and other agent models so useful in communicating complex behaviors that otherwise would be hard to do in nontechnical language, if not impossible.

In the case of SOTCAC, which is an agent terrorist network model, the results of runs are similarly displayed in a manner that both respects the nature of the simulations—social networks—and taps into how we naturally tend to visualize and think about such spaces. Heavy emphasis is thus given to displaying mathematical graphs along with associated metrics that describe their structure and dynamics. Most of the technical aspects of what goes into defining such structures and their evolution is always available but, again, is deliberately suppressed for clarity of presentation.

In short, the results of any model—and particularly those of agent models—are best communicated by making use of well-crafted visualizations that are readily and intuitively understandable. Indeed, I believe that one of the most underdeveloped aspects of M&S practices within DoD is the lack of attention given to the presentation of results. Edward Tufte's books on the visual display of information, for example, ought to be required reading.

Q: *What about modeling for problems that are more than 12 months out? In other words, from the vantage point of complex adaptive systems, what methodology—CA, GA, PDEs, dynamic gaming, etc.—would you recommend? I am referring to problems that have a near-infinite problem space with respect to their solutions. That is, although the*

IED problem is a tough one, the goals are to prevent them or to defeat them or to culturally influence the builders to not build them. But the problems I'm addressing are the ones that are much more conceptual–what actions do I take in Uzbekistan, in Nigeria, in Guatemala, in space, in the U.S., and I mean the full spectrum of actions: political, economic, military, information, infrastructure, and social? What things do I do to prevent the dreaded option closeout? This is an n-hard problem, and I have yet to find anyone willing to tackle it. I am not interested in short-term effects but rather in which modeling tools would be best suited to the concept of setting conditions for later exploration or exploitation.

Dr. Andy Ilachinski – I'll answer this question in the context of SOTCAC, the model of terrorist-counterterrorist coevolutions that I am currently developing. On pages 13–17 of the print version of my slides, posted on the URW Symposium website, I outline a concept for using agent models to facilitate an interactive and open-ended exploration of coevolving possibility landscapes. My comments apply equally to other agent models that may be used for scenario planning and strategy exploration.

To begin, I emphasize that agent models are generally best used as computational engines for exploring ensembles of states of a complex adaptive system in the context of a multidimensional superspace that defines all possible evolutions of the dynamical system. Arguably, the least meaningful way to use such a model is as a black box predictor of specific events. Agent models take a generative—as opposed to a deductive or inductive—approach to understanding system behavior: they provide a proof by demonstration that a given microlevel specification of a system's parts and interactions is sufficient to generate a desired subset of macrolevel behaviors. Because their modeling utility derives almost entirely from such generative explanations of phenomena that are otherwise inaccessible via conventional models, researchers must guard against inappropriate use, the most grievous of which is outright prediction.

However, the fact that a system may be unpredictable in principle—a property attributable to and reflective of an inherent irreducible complexity typical of complex systems—does not preclude our ability to understand or explain critical behaviors of that same system. For example, in his book [Generative Social Science, Princeton Univ. Press, 2007], Joshua Epstein offers the analogy that although evolutionary theory does not predict the phenotypes observed in nature, it is perfectly adequate to explain the phenomenon of species diversity. Similarly, I would say that for vastly open-ended problems of the kind addressed in this question—12 years out—an ideal toolkit is one that provides an analyst the ability to rapidly explore large swaths of the possibility landscape as defined by the analyst's own experience and mental models of the dynamics of the scenario.

The best that any model can do is provide a well-defined extension of our internal mental models; the model is useful only insofar as it provides a means by which the consequences of our beliefs and assumptions can be worked out more rapidly than we are able to with pencil and paper alone.

Let me explore this idea a bit further using SOTCAC as a specific example. SOTCAC is designed to help analysts explore ways in which networks form, evolve, and adapt. It does so by providing the computational and visualization tools to generate and explore a portion of the superspace of all possible network trajectories. Sets of possible network state trajectories appear along a timeline from left to right and are ordered vertically according to network fitness. Fitness is measured relative to the terrorist network itself: low fitness for low mission readiness/capability and high fitness for high mission readiness/capability. More precisely, this provides a slice of the superspace of all possible terrorist-counterterrorist coevolutions, consistent with the premise that terrorist networks are autopoietic dynamical systems whose persistence and strength depend as much on cohesive internal forces as they do on disruptive external forces.

Once a scenario is defined—in that the properties, motivations, and interaction rules of all agents have been set and the way in which the counterterrorist force gathers and acts on intelligence has been prescribed—SOTCAC generates an ensemble of possible evolutions of the system. Different kinds of terrorist-counterterrorist interactions are highlighted in red and green. For example, the counterterrorist force may either probe, while minimally disturbing a link, or attack a link or agent by either disrupting or eliminating an active link or killing an agent. Whatever the action, the terrorist network inevitably reacts by locally reconfiguring its state and adapts to the localized disruption by altering its trajectory in superspace. From the counterterrorist network's perspective, the problem is to find a strategy—defined as a dynamic context-dependent sequence of probes and attacks—that will reduce the terrorist network's ability to achieve a mission-ready state. The counterterrorist force is motivated, as a whole, to drive the terrorist network's evolutionary trajectories towards the low end of the mission fitness scale. Ideally, the counterterrorists want to confine the terrorist network to the region of the superspace outlined by the dotted red curve in the upper right.

As an example of the kinds of insights that SOTCAC offers the counterterrorist analyst, consider the role that structural holes play in the information flow and social dynamics of a network.[1] Because structural holes sit on the boundaries between flows among otherwise separate cliques of knowledge structures, agents spanning these holes may be expected to wield a strong influence over the network's local and global functioning and performance because they represent locations within the network from which other areas of the network can be reached with a minimal number of direct ties. A number of questions immediately present themselves: How do these structural holes form? How can the strength of their influence be measured? Can they be exploited by the counterterrorist force in some way? Can they be reliably used to target an attack on the terrorist network?

The answers to these and other questions can be explored systematically by using SOTCAC to effectively map out the

[1] Structural holes represent a latent source of social capital that agents can exploit both directly (by using their central position to maximize access to information not accessible by others and thus streamlining their acquisition of resources) and indirectly (by forging links that create holes that may be exploited in the future). Agents can maximize their entrepreneurial networking opportunities by fashioning their local neighborhoods to provide multiple structural holes around their neighbors but none around themselves. See R. S. Burt, *Structural Holes: The Social Structure of Competition*, Harvard University Press, 1992.

dynamic consequences of various initial conditions and specified agent behaviors.

Operationally, the ability to probe properties of terrorist networks assists intelligence analysts in at least two ways: (1) by strengthening the veracity of vulnerability assessments—pinpointing the nodes and cliques of a network that are vital to information flow enables identification of key agents whose removal can be expected to significantly degrade the network's ability to command and/or to control its agent/cell infrastructure; and (2) by optimizing data collection requirements and resource allocation decisions—because the existence of structural holes may be inferred, indirectly, from the effect of as yet unobserved agents on other parts of the network, the analysis can help focus the attention of HUMINT, COMINT, or other INTEL data collection assets on the most promising components of the network for further reconnaissance and/or attack.

The data from known incomplete and imprecise terrorist network generative models, like SOTCAC, can suggest the properties and locations of critical components of the network that are likely to exist but have not yet been detected. Structural holes are but one example of a critical network property that is both objectively defined and measurable. However, it is not the only measure or even the most relevant. A priori, any, or some heretofore unsuspected combination of primitive network metrics—characteristic path length, clustering coefficient, centrality, betweenness, etc.—may be used to gauge the relative importance of selected components to a network's overall ability to function. The deeper question is: which of these metrics, and in what dynamical context, provides the counterterrorist force the optimal basis on which to mount its surveillance tactics and attack strategy?

Is a terrorist's mission best thwarted by eliminating its most highly connected terrorists? Is it better to target its cell leaders? Or, is it best to leave its most highly connected terrorists untouched but with continued covert surveillance and eliminate the links between mid-level operatives and supporting agents? Any strategy to defeat a network that is based solely on optimizing efficiency metrics, without regard to either the properties that characterize the specific network being attacked or the dynamical consequences of how the network is likely to adapt to the actions taken against it, is doomed to fail. At best, such strategies will be shortsighted and suboptimal; at worst, they may inadvertently nudge the system's trajectory to take a track that does more harm than good.

For example, although a strategy to remove a strong, charismatic leader—implemented in the hope that the leader's loss results in a systemic collapse of a network—may succeed, it is also just as likely to fail catastrophically. Such a strategy may appear intuitive; unfortunately, it may also provide the remaining components of the decapitated network with an energy that both stimulates and strengthens it.

Robust strategies can be identified as such only by understanding how the set of all possible actions that a counterterrorist organization can take—in all possible contexts—is dynamically related to the set of all possible measures of how well a terrorist network functions. Such an understanding relies on a systematic exploration of the multidimensional superspace that contains all possible outcomes of terrorist-counterterrorist coevolutions.

The goal for developing SOTCAC is to provide analysts with a larger context of terrorist-counterterrorist network coevolutions so that terrorist networks and how they adapt can be better understood.

Q: *Are these models running along the same lines of clique-percolation theory? If so, can you elaborate?*

Dr. Andy Ilachinski – Percolation is essentially a simple model of a disordered system and is but one mathematical/analytical technique under the vastly broader rubric of complexity theory.

Consider a square lattice, where each site is occupied randomly with probability p or empty with probability 1-p. Or, equally, consider the set of all links between sites in a network, each of which has a certain probability of existing. Occupied and empty sites may stand for very different physical properties. For example, suppose the occupied sites are electrical conductors, the empty sites represent insulators, and electrical current can flow between nearest neighbor conductor sites. At low p values, the conductor sites are either isolated or form small clusters of nearest neighbor sites. Two sites belong to the same cluster if they are connected by a path of nearest neighbor conductor sites and a current can flow between them. At low p concentrations, the mixture is an insulator because a conducting path connecting opposite edges of the lattice does not exist. At large p values, conversely, there are many conduction paths between opposite edges through which electrical current can flow, and the mixture is a conductor. At some concentration in between, therefore, a threshold concentration p* must exist where, for the first time, electrical current can percolate from one edge to the other. Below p*, we have an insulator; above p*, we have a conductor. The threshold concentration is called the percolation threshold or, because it separates two different phases, the critical concentration.

Percolation theory is a well-developed, mature field of study and, indeed, has proven useful in many related studies of network dynamics—for example, *Percolation* by Bela Bollobás and Oliver Riordan [Cambridge University Press, 2006]. A reference for cliques—essentially a mathematical means by which certain patterns may be automatically detected within ostensibly complex networks—as well as many other ideas relating specifically to what we currently understand about complex networks, is a recent compendium on the subject, *The Structure and Dynamics of Networks* by Newman, Barabasi, and Watts [Princeton Univ. Press, 2006].

Q: *To what extent have the models and algorithms that you described influenced national security policy? Are there or will we be seeing products of this analysis on the ground in our current theaters of operation?*

Prof. Gary Shiffman – I hope so. Through the American Economic Association, I have witnessed a growing interest among economists in national security. I take the conference organizer's invitation to me as a sign that the National Security policy community is starting to notice economic analysis. In fact, from the NSC across the federal government, economic analysis is playing a larger role in decision-making.

Q: Many Americans, it seems, oppose the policies that we employ versus terrorists. If the terrorists are zero-sum game-oriented and Americans are willing to achieve saddle points, how do you reconcile this multiparty game?

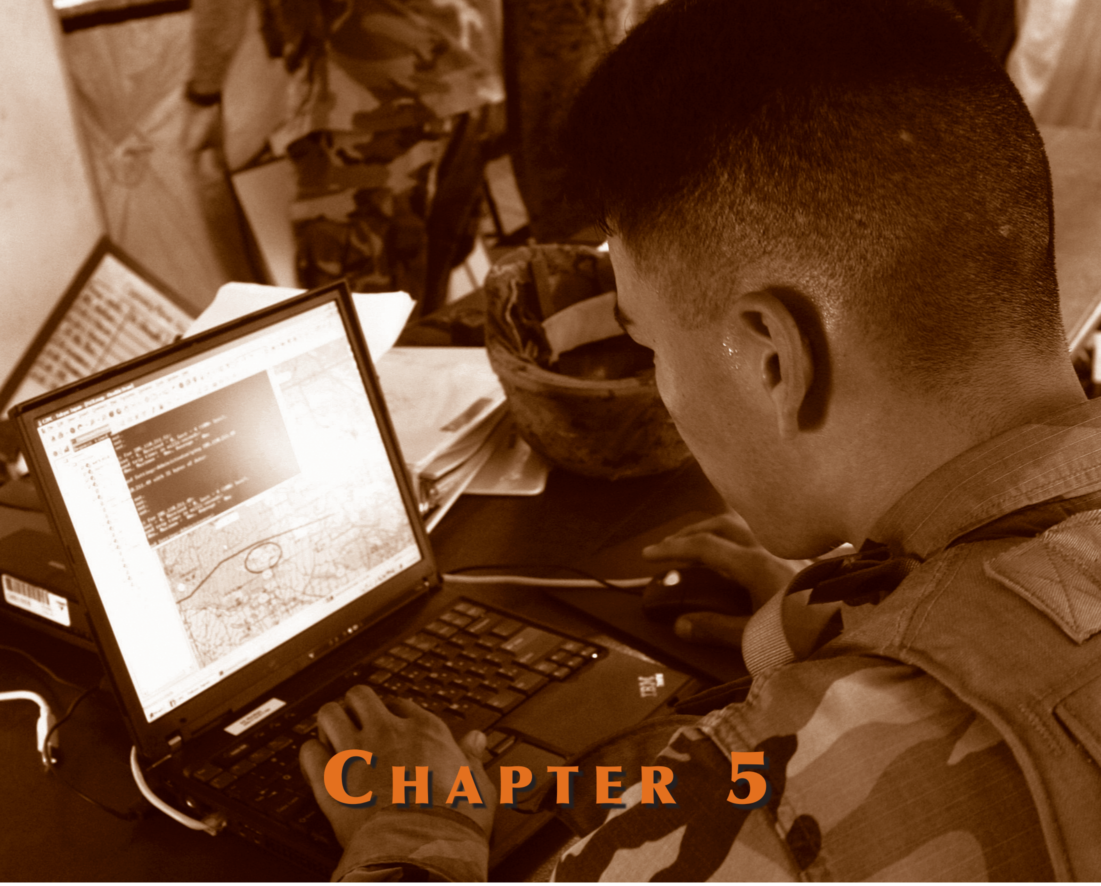
Prof. Gary Shiffman – I'm not comfortable aggregating the preferences of all terrorists in one blanket statement. If you give me a particular case, economic analysis will allow you to conduct useful analysis for the policymaker.

Q: Regarding your discussion of Becker's work: this would seem to be just another definition of risk—Probability x Effect. But how can we, either frequentists or Bayesians, do any work on this as it applies to terrorists? We have a very small dataset, and it seems like you are able to make comments retrospectively rather than to know what would happen with a given set of precursors.

Prof. Gary Shiffman – I agree with your comment and think we should be careful before generalizing across all terrorists. We can use models applied retrospectively to develop a predictive capability about specific policy questions prospectively. One lesson of economic analysis is that all terrorists are not alike.

Q: It seems like your work aggregates prospect theory and fundamental attribution errors. Can you please explain how we can make assumptions about individual desires? Does your hypothesis mean that the power of perception management and deception is grossly underused in our inventory?

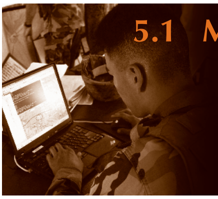
Prof. Gary Shiffman – First, prospect theory and attribution errors must be understood for the use of economic analysis. Because we are disaggregating the decision-making process and focusing on individuals, we need good information and good analysis of what the target individual seeks to maximize. In addition to greater emphasis on intelligence, I agree with your question that we need to put more emphasis on strategic communications.



Chapter 5

Technology Roundtable

URW in the Information Domain



5.1 MODERATOR'S SUMMARY

Timothy Galpin

INTRODUCTION

Although the control of information has long been considered part of warfare, in this discussion, we consider the proposition that the information domain has become a distinct battlespace with its own winning strategies, tactics, and technologies. That is, although we continue to see improvements in traditional warfighting capability brought about by net-centricity, in the era of unrestricted warfare, we can expect to see some battles being fought strictly in the information domain.

There is a tendency to equate the information domain with computer networks, but we are more properly concerned with information networks on a global scale. These networks are enabled by a host of related technologies such as Global Positioning System (GPS), wireless communications, satellite routing, telecommunications, and Internet infrastructures. They carry information that touches every aspect of national security from government to commerce and from defense to law enforcement and intelligence as well as research and development. Clearly, the United States and its allies have enjoyed success in employing information technologies and developing asymmetric advantages

Mr. Timothy J. Galpin leads the Infocentric Operations Business Area at The Johns Hopkins University Applied Physics Laboratory. He specializes in strategic planning and program management for information operations, information assurance, information networks, and intelligence. Mr. Galpin, a former Naval officer with extensive experience in defense policy and submarine operations, holds degrees from the United States Naval Academy and Oxford University, where he studied as a Rhodes Scholar.

in the information domain. Just as clearly, our reliance on the information domain has created vulnerabilities that must be considered. At the same time, the globalization of critical information technologies provides our adversaries the means to hold us at risk, whether by using the Internet for command and control or by attacking and exploiting our information infrastructure.

ORGANIZATIONAL TRANSITIONS

This ongoing development of the information domain has led to a need to organize and reorganize U.S. institutions to accommodate evolving capabilities. Examples abound and include the creation of the United States Computer Emergency Readiness Team (US-CERT) to protect the nation's Internet infrastructure as well as the establishment of an information-sharing environment for the Intelligence Community. In DoD, examples include assignment of computer network operations to a warfighting combatant command, STRATCOM, which in turn, created joint task forces such as the Joint Force Component Command Network Warfare (JFCC NW) and the Joint Task Force Global Network Operations (JTF GNO).

> *". . . although we continue to see improvements in traditional warfighting capability brought about by net-centricity, in the era of unrestricted warfare, we can expect to see some battles being fought strictly in the information domain."*

The first presentation illustrates the continuing nature of these efforts to organize effectively to fight in the information domain. Colonel Steven "Mac" McPherson, Deputy Commander of the U.S. Air Force Cyberspace Task Force, describes the factors considered in developing the concept of operations for the newly announced Air Force Cyberspace Command (CYBERCOM). Each of the Services, all of which are tasked to "organize, train, and equip" their forces for war, have developed information commands (e.g., Navy's Naval Network Warfare Command (NETWARCOM) and Army's 1st Information Operations Command). However, CYBERCOM is unique in its intent to establish an integrated cross-domain strategy to fight and win in air, space, and cyberspace.

STRATEGIC FOCUS

Beyond organizational issues, it is interesting to note a strategic role reversal in the information domain. Traditionally in warfare, the force standing on the defense is considered to have a force advantage. However, in information operations, the attacker has the advantage. Consider that the incentives to attack and exploit our information networks are high. As previously noted, reliance on the information domain creates an asymmetric vulnerability. Further, vulnerabilities in our networks are extremely difficult to identify, primarily because of the large opportunity space. Network defense must encompass the individual computers, the installed software, and the associated networks. The attacker needs only to successfully penetrate one of these levels to have sufficient access to accomplish his agenda.

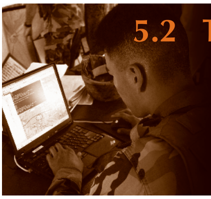
Mr. Jim Gosler, a Fellow of Sandia National Laboratories and the founding Director of the Clandestine Information Technology Office, combines deep technical expertise and firsthand leadership experience in the Intelligence Community. His presentation demonstrates that our failure to organize effectively to provide information assurance, combined with a lack of awareness, multiple access points into networks, life-cycle induced vulnerabilities, and a persistent attack effort by our adversaries, puts the United States at tremendous risk in the information domain.

NEED FOR A NEW THREAT MODEL

Our final presentation places the notion of unrestricted warfare in the information domain in a broader context. Mr. Dan Wolf, for many years a senior leader at the National Security Agency and now a leading consultant on information assurance issues, makes a compelling case that the Unites States is already at war in the information domain. His survey of known tools and available delivery mechanisms illustrates the risk to our information networks. It is clear that a new threat model is required that addresses a spectrum from hackers, criminals, and industrial spies to terrorists and, ultimately, the sophisticated nation state. The risks from each of these adversaries varies in complexity and severity but, taken as a whole, mandate an organized response from the United States that encompasses our governmental, defense, intelligence, and commercial sectors.

CONCLUSION

Even though it is tempting to rely on the Cold War notion that dealing with the most dangerous case (in this case the sophisticated nation-state attack) subsumes the lesser adversaries, that would be a mistake. What is required instead is a comprehensive approach that develops effective technological capabilities to maintain our advantages in the information domain; deters and prevents attacks across the range of adversaries; provides measured response options when attacks are detected; and perhaps, most importantly, develops a national consensus that the battle has been joined.



5.2 THE DIGITAL DIMENSION

James Gosler

INTRODUCTION

This presentation is adapted from a book chapter I wrote that was published in 2007 as "Transforming Intelligence: The Digital Dimension." Communications technologies have transformed the way information is created, stored, processed, viewed, and transmitted. But the same technologies have provided our adversaries with the tools for attacking and exploiting our intelligence and military systems. The U.S. has long operated under the assumption that our critical systems would be secure if we applied current Information Assurance (IA) practices. The reality is that a sophisticated offense easily outmatches the capability of a defensive organization to protect its critical Information Technology (IT) systems.

My perspective is significantly affected by the 5 years I spent in government. During that period, I cochaired, with Dan Wolf for some of that time, an operations executive committee that

Mr. James Gosler is Sandia National Laboratories' sixth Fellow and has served NSA as Sandia's first Visiting Scientist. Formerly, Mr. Gosler entered the Senior Intelligence Service at CIA as the first Director of the Clandestine Information Technology Office (CITO), where he earned the National Intelligence Medal of Achievement; the DONOVAN Award; the Intelligence Medal of Merit; the CIA Director's Award; the Clandestine Service Medallion; and several foreign awards. Mr. Gosler was a Naval Officer from 1975 to 2003. His personal awards include the Legion of Merit. He has completed the National Senior Intelligence Course, Harvard's Program for Senior Executives in National and International Security, Aspen Institute's Senior Executive Seminar, and the Intelligence Fellows Program. He holds a Bachelor of Science and Masters degree in Physics and Mathematics.

analyzed the spectrum of potential offensive capabilities against U.S. IT systems and provided oversight for various operations. It was from this vantage point it became very clear that a large gap exists between offensive and defensive capabilities and that we as a nation, need to aggressively address this imbalance.

Many people working in this area have sounded the alarm about Information Assurance (IA). ADM Bill Studeman, a former director of NSA, deputy director of the CIA, and a member of the WMD commission, believes that IA is the biggest problem facing the national security establishment today. This has not gone unnoticed by our adversaries. Our adversaries know that our Air Force, Navy, and Army are big and muscular and militarily superior, but they also see brittle bones under all that muscle. The reasonable person who does not want to die would develop a strategy to go after those weak bones.

> *"This has not gone unnoticed by our adversaries. Our adversaries know that our Air Force, Navy, and Army are big and muscular and militarily superior, but they also see brittle bones under all that muscle."*

Group Insanity

Last summer, a senior General Officer briefed the Defense Science Board (DSB) Summer Study on Information Management for Net-Centric Operations. He reported that many systems are being developed in this domain, but it appears that many of the Program Managers responsible for developing these systems seem to be taking the view that they are not going to be subject to attack. That phenomenon is pervasive throughout our government. It is insanity to continue to design these mission-critical systems as if they were going to operate in an adversary-free environment. Clearly, a warship is a weapon that will be going into harm's way. If it is not designed to withstand missiles and bombs or torpedoes, it will be a useless platform for projecting power.

I recently read a story about a con artist, who exploited weaknesses in the real estate recording process to fraudulently gain titles to homes. He claimed that he was so successful because the system was built on a premise that we are all sheep; there are no wolves. Those of us in the intelligence business have been wolves for a long time. It is hard for many of our system designers to understand that their systems are going to be attacked by creative, innovative people, who think very naturally and comfortably outside the box. But if our defensive architecture doesn't take that into account, we lose. Our adversaries have the inherent advantage that they have no reservations about cheating to win. They get to pick the time, the place, and the method. They won't go after our strength—they do their targeting and analysis on our fractures.

THE OFFENSIVE ADVANTAGE

Victor Sheymov, a former KGB officer, has written a fascinating book, *Tower of Secrets*. Sheymov conducted a number of technical operations in the 1990s. He relates a story about a foreign mission that was moving a truck of electronics from point A to point B in the Soviet Union. While the vehicle was stopped at a checkpoint, a KGB team unlocked and entered the back of the truck. As the truck went on to its destination, the team inside opened all the boxes, modified the electronics, and carefully resealed the boxes. At the next checkpoint, the team got out. When the electronics were delivered to their destination, every piece had been compromised.

When we describe these kinds of scenarios to some of the people we deal with, they say, "That is science fiction." But it happens every day. Sophisticated intelligence organizations build those kinds of capabilities to gain an advantage over their adversaries. Offensive adversaries are exceptionally good at it and are willing to take operational risks.

The offense has the ability to choose the time, the place and the method of attack. When they are working at their best, they see the target from a systems perspective and work as a collaborative team. They will attack at the target's weakest point. The defense must be strong enough to withstand the strength of the offense at its weakest point

. . . a daunting challenge!!!!!

Figure 1 The Offensive Advantage

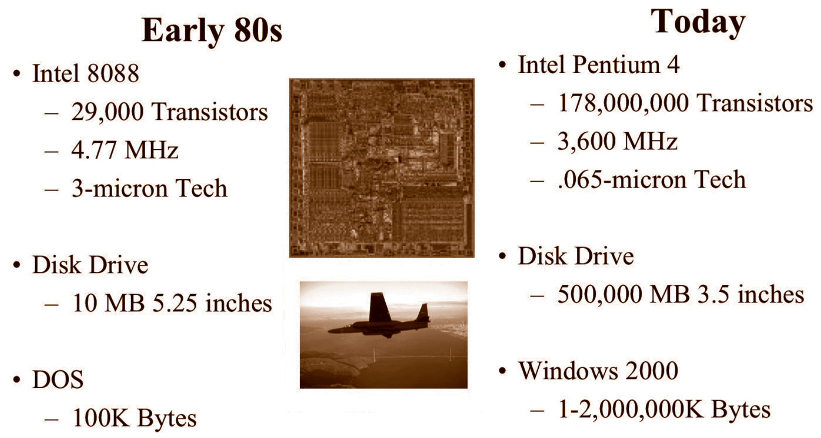
Trust and Complexity

There is a school of thought that holds that you can narrow the gap by "evaluating yourself out of the hole." If that is your strategy, you are in big trouble. In the mid 1980s at Sandia Labs, we were transitioning technology in the nuclear weapons use control area from conventional discrete electronics to microcontroller microprocessor-based systems. Back then, it was easier, quicker, and sometimes cheaper to outsource some of the microelectronics rather than building ASICs. Today, I would not be able to trust those systems. The typical microprocessor then was 29,000 transistors and already complex. Now, microprocessors are approaching a billion transistors and are unbelievably complex. When our adversaries are playing cheating-to-win kinds of games, we cannot trust anything we do not build ourselves.

This is not a new concept. In 1984, Ken Thompson of Bell Labs, in an article entitled, "Reflections of Trusting Trust," stated, "The moral is obvious. **You can't trust code that you did not totally create yourself . . .** No amount of source-level verification or scrutiny will protect you from using untrusted code." Thompson's insight was progressive, the situation he described is even worse today. **You may not even be able to trust code that you totally created yourself!** Even though you might have complete confidence in your software design and implementation, including its binary representation, you would most likely have no confidence in the fidelity of the hardware platform on which the software is executing.

"Our adversaries have the inherent advantage that they have no reservations about cheating to win. They get to pick the time, the place, and the method. They won't go after our strength; they do their targeting and analysis on our fractures."

People often think in terms of either software or microelectronics, not both. But it is in the integration of the two where problems can arise. For example, a vulnerability can be exploited by causing an external interrupt in a microprocessor with a 250-nanosecond time level. This is a level of complexity that bears noting. Figure 2 shows the level of complexity of current IT trends as opposed to those of the 1980s.



Early 80s

- Intel 8088
  - 29,000 Transistors
  - 4.77 MHz
  - 3-micron Tech
- Disk Drive
  - 10 MB 5.25 inches
- DOS
  - 100K Bytes

Today

- Intel Pentium 4
  - 178,000,000 Transistors
  - 3,600 MHz
  - .065-micron Tech
- Disk Drive
  - 500,000 MB 3.5 inches
- Windows 2000
  - 1-2,000,000K Bytes

Figure 2 IT Trends Yesterday - Today

DOMAIN OF VULNERABILITY

If I'm going to put you in close contact with something that's valuable to me, I need to trust you. How do I increase my confidence that you're trustworthy? I'll take you through background investigations, polygraphs, etc. Depending on the value of my asset, I might investigate more closely and more often. But how do we make sure our technology is trustworthy?

> *"We're talking about an adversary that has worldwide presence, significant resources, billions of dollars, a network of trusted partners, and a network of untrusted partners."*

There are two basic kinds of vulnerabilities within this world: those that are inherent to a system or component and those that are operationally introduced (Figure 3). The objective of exploiting the vulnerability is to render the system inoperable, to steal information out of that system or about that system, or—even more powerful—to make the user lose confidence in the integrity of that system. That vulnerability can be exploited either remotely or with close access. For example, an adversary could take advantage of vulnerabilities in Microsoft Explorer to steal information from a computer connected to the Internet.

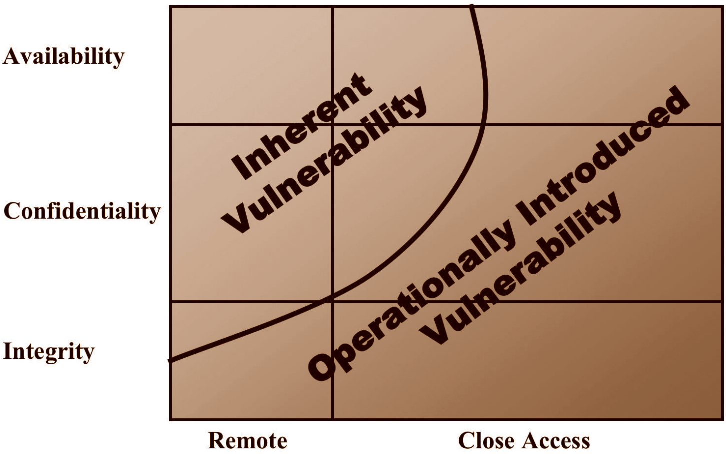


Figure 3 The Domain of Vulnerability

CHARACTERISTICS OF SOPHISTICATED ADVERSARIES

Consider what that Soviet team had to do to introduce vulnerabilities in the electronics. They had to know what was in the boxes. They had to have duplicates of those components that they could disassemble and analyze for inherent vulnerabilities that could be exploited. They had to figure out how to modify the technology to their operational advantage, subtly and undetectably and within the timeframe available to them in the back of that truck.

> *"A critical element in a defensive strategy is the innovative application of offensive capabilities to support defense objectives."*

We are not talking about someone hacking into our home computers. We are talking about an adversary that has worldwide presence, significant resources, billions of dollars, a network of trusted partners, and a network of untrusted partners. They integrate offensive and defensive operations—two enemies will join forces to defeat another enemy. That is a powerful capability for an organization to have and one that we in the U.S. do not demonstrate very well. From a defensive perspective when that kind of operation is focused on you and you have not planned for it, you are in big trouble.

RISK MANAGEMENT

In the digital dimension, we think in terms of access. Where is the software being developed today? Where is it being maintained? Where is it being retired? Each one of those areas gives the bad guys an opportunity to do what the Soviets did in the back of that truck. When they are successful in implanting some error in the design phase, they win forever. If it evades the level of evaluation at that point in its life cycle, it will never see that level of evaluation again.

Access + *Tech Capability* + *Vulnerability* + *Weak Defenses* + *High Dependence*	=	**DISASTER**

Figure 4 Formula for Disaster

Table 1 shows the evolution of the problem of risk management in the digital domain. The bad guys are getting increasing access to our software and our electronics. They are getting better; they are getting smarter; and we are not going to evaluate ourselves out of the hole. The gap is not narrowing; it is widening. The impact of a failure in the business or government domains is huge. Why would we keep building or designing systems as if they were not subject to attack? Our opponents' access is increasing; their technical capabilities are increasing; and their resources are abundant.

Table 1 Risk Management Challenges

Software Development - Foreign Manufacture
Microelectronic Fabrication - Foreign Manufacture
Brain Trust - Foreign Manufacture
Complexity Increasing Exponentially
Defensive Measures Losing Ground Rapidly
U.S. Dependence Growing Dramatically
U.S. Conventional Military Dominance Drives Adversary to Asymmetric Approach
Offensive Capability Well Within Reach of Enemy
Impact of Defensive Failure Growing Dramatically

Figure 5 shows a notional development of technical and operational competence for capability classes of adversaries from hacker to sophisticated.

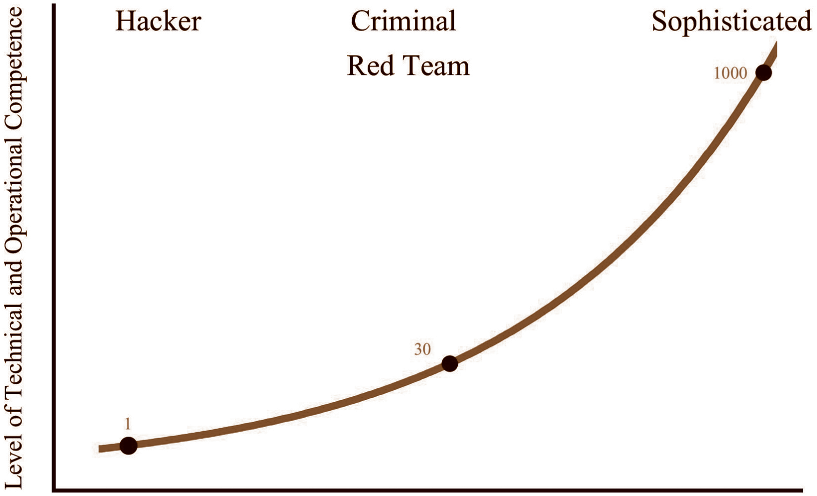


Figure 5 Classes of Adversary

COMPUTER NETWORK DEFENSE

Many people within the Defense Department think very little about computer network defense (CND) (Figure 6) relative to a sophisticated full spectrum adversary. They think they are protected if they use antivirus tools, spamware, firewalls, and intrusion defense systems; configure them perfectly; and keep them updated. But the offense is playing a different game. We have spy recruiters, a signal intelligence (SIGINT) organization that provides targeting and analysis, a potpourri of clandestine technical capabilities, liaison relationships with intelligence services, and deception and cover. If the adversary does his job well, he will get the same results as the Soviets did in the back of the truck; in other words, if he cheats, he wins. Depending on the application of the technology, the impact of losing can be huge.

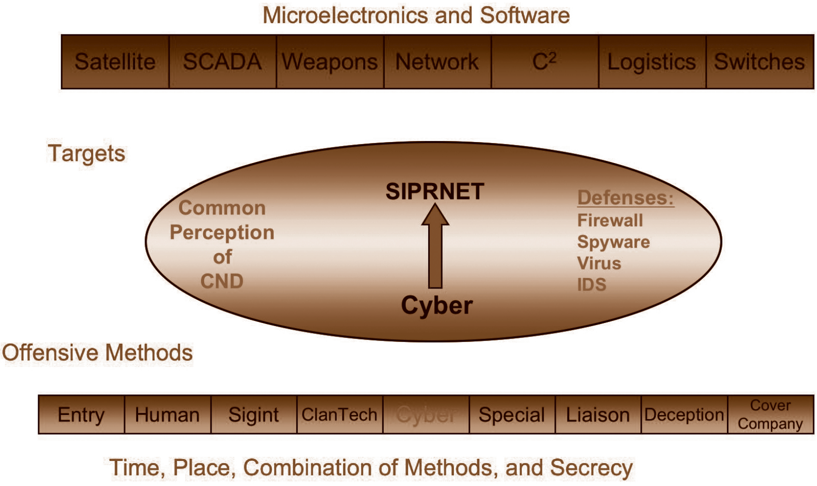


Figure 6 The Ambiguity of Computer Network Defense

Project Gunman is an example of what an adversary can do. The Soviets modified IBM Selectric typewriters in the U.S. embassy so that everything typed on the typewriter was transmitted to a listening post nearby the embassy. This happened 30 years ago. Do you think they've stopped playing the game?

A SUCCESSFUL DEFENSIVE STRATEGY

It is not all doom and gloom. There are ways to narrow the gap. Some of them are listed in Table 2. Items 9 through 12 are related. If you have sufficient resources invested in a system in terms of dollars and people, you want to protect it. The question is: will this investment increase the probability of detecting bad behavior and the probability of attributing the bad behavior? Will it decrease the impact of a failure on the U.S. and significantly increase the consequence to the attacker if caught? Every investment we make within this business has to affect that equation.

Table 2 Elements of a Successful Defensive Strategy

1. Decrease inherent vulnerabilities within hardware and software.
2. Increase difficulty of an adversary introducing vulnerabilities through the lifecycle.
3. Increase our ability to deeply evaluate critical components.
4. Decrease unneeded functionality in critical components/systems.
5. Increase the cost and uncertainty to an adversary.
6. Decrease the adversary's confidence that an asymmetric IO strategy will be broadly effective.
7. Increase the coupling of offensive and defensive elements.
8. Increase U.S. insight into the offensive IO capabilities and intentions of our adversaries.
9. Increase the probability of detecting a component that is behaving badly.
10. Increase the probability of attributing the bad behavior to the adversary.
11. Increase the consequences to the attacker for its bad behavior.
12. Decrease the impact of a defensive failure.

A critical element in a defensive strategy is the innovative application of offensive capabilities to support defense objectives. Historically, offensive and defensive elements within our country have shunned each other. But attitudes are changing, primarily because the consequences of defensive failures today are staggering. Why not combine resources to protect the nation? The good news is that this transformation is actually starting to happen; organizations in the United States have had epiphanies. They are applying energy to narrowing that gap. We are just beginning, but this activity looks very promising.

I highly recommend the book "Who Says Elephants Can't Dance?" by Louis Gerstner, Jr., which discusses the difficulty of changing a large, dysfunctional institutional culture. According to Gerstner:

"Successful institutions almost always develop strong cultures that reinforce those elements that make the institution great. They reflect the environment from which they emerged. When that environment shifts, it is very hard for the culture to change. In fact, it becomes an enormous impediment to the institution's ability to adapt."

CONCLUSIONS

Technology alone is never going to solve the IA problem. We have no informed national defensive strategy in this area. The situation is starting to change and improve, in large part because visionaries like General Cartwright are in key slots. But we do not have a lot of time. The intelligence community is not sufficiently engaged in conducting, analyzing, and reporting those issues. During the Cold War, we analyzed Soviet capabilities exhaustively. We did everything possible to understand our adversary and manage that gap. We need to do the same thing today.

The bottom line is that it is dangerous to underestimate the capabilities of our adversaries. They do whatever it takes to win. Good adversaries know our strengths and weaknesses. They develop surprising partners that sometimes do not even know they are partners—they will give someone an honorarium to talk at a conference and ask that person for information on associates. They play by a different set of rules. They see offense as a systems problem, while our defense is fragmented.

Table 3 lists some relevant observations regarding Information Assurance. The important point to remember is never underestimate the motivation, patience, and creativity of an adversary! He is attacking against a defense that is naïve, arrogant, unbalanced, and fragmented. We are critically dependent on our technology, but the gap between offensive and defensive capability is huge and growing. We must find a different path. We have to recognize that our systems are vulnerable to sophisticated attacks and find ways to defend against them.

Table 3 Observations Relevant to Information Assurance

There is NO short-term answer. Technology alone will never be sufficient.
There is NO informed National Defensive Strategy.
There is NO one person in charge, responsible, and accountable across the full threat spectrum.
There is insufficient coupling between U.S. offensive and defensive activities.
Little effort is focused on development of a national technical cadre: deep, broad, sustainable . . . experts!
The Intelligence Community (IC) is not sufficiently engaged in the collection, analysis, and reporting on this issue.
IC reporting, in general, is not actionable from a defensive perspective.
Senior decision-makers lack insight into the criticality and complexity of this issue—risk management is difficult.
Principal adversaries of the U.S. understand and are acting upon the asymmetric opportunities in this area.

5.3 CYBERSPACE ... THE UNDECLARED WAR!

Daniel Wolf

INTRODUCTION

Today, the United States finds itself in an undeclared war in cyberspace. Many of us still do not understand what the threat is, what really exists out there, and how sophisticated the adversary is. To reiterate a point Jim Gosler made, playing offense is much easier than playing defense. In offense, you have to find the one open window or door in the building, and you're in! For defense, you have to find all of them and close all of them. This article discusses some of the cyber windows we need to watch.

Although the quote in Figure 1 is from 1991, it still applies today. In fact, this quote was used in the Department of Homeland Security's testimony before Congress in February, 2007. The point that tomorrow's terrorist may be able to do more damage with a keyboard than with a bomb is very relevant to our ability to perceive and define the threat and realize we are at war in cyberspace.

Mr. Daniel Wolf, President, Cyberpack Ventures, Inc., consults on a variety of Information Assurance, Intelligence, and Homeland Security topics, drawing from 39 years in federal service with NSA and DoD. He has received numerous awards from the Defense and Intelligence communities, including the Presidential Rank Award of Distinguished Executive, two Presidential Rank Awards of Meritorious Executive, the DoD Distinguished Civilian Service Award, and the DoD Medal for Meritorious Civilian Service. He received the NSA Exceptional Civilian Service Award and the NSA Director's Distinguished Service Medal. Mr. Wolf holds Bachelors and Masters of Science degrees in Electrical Engineering. He is a graduate of the Senior Executive Fellow Program at Harvard University (Kennedy School of Government) and the Federal Executive Institute (FEI).

> "We are at risk. America depends on computers. They control power delivery, communications, aviation, and financial services. They are used to store vital information, from medical records to business plans, to criminal records. Although we trust them, they are vulnerable—to the effects of poor design and insufficient quality control, to accident, and perhaps most alarmingly, to deliberate attack. The modern thief can steal more with a computer than with a gun. Tomorrow's terrorist may be able to do more damage with a keyboard than with a bomb."
>
> "Computers at Risk," National Research Council, 1991

Figure 1 Modern Warfare

CYBER PEARL HARBOR

In a 2005 survey of 1,286 Internet experts, conducted by the Pew Internet and American Life Project[1] and Elon University, a significant percentage of them predicted that a devastating attack on the U.S. information network will occur in the next 10 years. In review of the 2006 URW Proceedings, the following points stand out as elements of what is considered to be unrestricted warfare:

- Practitioners
  - State and non-state actors
- Gain advantage over stronger opponents
  - By military and nonmilitary means
- Rules of engagement
  - There are none.
- Involves multidimensional attacks:
  - Social, political, and economic
- Surprise and deception
- Civilian technology and military weapons
  - Break the opponent's will

[1] http://www.pewinternet.org/

The hypothesis is that the U.S. is at war today in cyberspace but has not yet fully realized it. World War III is starting in cyberspace, not like the "cyber Pearl Harbor" that is often discussed in the community and even in some congressional testimony; but it is creeping in slowly. We have had many computer virus and worm attacks such as Moonlight Maze, Titan Rain, and similar activities, which are described later in this article. There are many more examples of such attacks, some of which are classified.

Attacks have also been carried out on the Internet infrastructure. Several years ago, an attack was launched on the very fabric of the Internet—the address tables—that persisted for several hours, almost causing the Internet to crash. It was estimated that, if it had crashed, the Internet would have been down for 2 weeks. When you think about what you do on the Internet today and how much we now rely on it, consider what it would mean if the Internet were down for 2 weeks. The attack was against a vulnerability that nobody had really thought about before.

The Internet is under daily reconnaissance by adversaries of the U.S. We are vulnerable in many ways because our technology is a monoculture: TCP/IP, Microsoft, and Intel chips. We have all our ships in one harbor. You can draw some parallels to the events preceding World War II, leading up to the beginning of the war. At what point do you say you have experienced an event that means you are really at war?

For perspective, Figure 2 lists some examples of attacks, starting with viruses and worms, which are not targeted typically against a particular individual; they are launched in the Internet environment to damage everyone. Some of the earlier events around 1999 were merely nuisances. The list progresses through increasingly damaging attacks like the Slammer worm, which crashed the Internet in about 16 minutes—or almost crashed the Internet in 15 minutes. It is clear from Figure 2 how quickly these attacks were spreading to increasing numbers of hosts and how great the damage was in dollars.

- Melissa worm (3/99)
  - Performance problems and doc leakage
- Love bug (ILOVEYOU) (5/00)
  - Widespread outages and losses of $5.5B (est.)
- Code Red virus (7/01)
  - Infected 359,000 hosts in 1 day
- Nimda worm (9/01)
  - Spread worldwide in 30 minutes
- Slammer worm (1/03)
  - "Crashed the Internet in 15 minutes"

Figure 2 Viruses and Worms

THE ADVERSARY'S TOOLKIT

The typical hacker today is a casual hacker, one of a small group—a typical cell might consist of 12 people—not necessarily college educated but born with a mouse in his hand. That means typical hackers have been using computers since childhood. They are from a generation that is not afraid to try anything with a computer. They can tie up vast resources that are required to extract their malware from a computer system. Because they are scattered worldwide and are working at it 24/7/365, they are beginning to represent a substantial threat. To give you a measure of the level of activity in cyberspace, a recent check of my firewall showed I had 701,068 probes that have occurred since the firewall was turned on; 4085 of them were considered serious.

Two events in the open source literature illustrate the kind of threat we face. Moonlight Maze was first detected in 1999, according to Wikipedia, which says the source was the Russian Academy of Sciences. That attribution is questionable because attribution is very difficult on the Internet. It is one of the greatest challenges, especially for CND (computer network defense) or active defense. Moonlight Maze went on for years, and significant amounts of information were pulled out of various facilities around the U.S. and transmitted to a foreign entity. Titan Rain started around 2004; according to Wikipedia, it is believed to be of Chinese origin. It was the same type of operation, systematically breaking into systems, looking for data, extracting data, packaging it, and sending it to a foreign area.

More sophisticated opponents typically run 24/7/365 from within a nation state that has plenty of resources. They are agile, flexible, and know every kind of operating system and application. They might work in groups of 12 to 18 people, who may focus on a particular "project." They know how to use Internet resources to conduct reconnaissance and to gather information. They are not necessarily computer scientists, but they are computer savvy because they have played with computers since childhood. The more sophisticated hackers are not just launching viruses to see what happens; they are targeting people or going after specific information or companies. They conduct SIGINT-like intelligence operations of their targets, identifying key senior people in a company and searching for the repositories of company or government secrets. They have a large, diverse tool kit that provides them many options so they can evade computer defenses. They intend to stay, and they are bold.

Even if we can identify the source country, we cannot know if it is state-sponsored because attribution is so difficult. They are disciplined, focused on the long term, and multi-INT (i.e., their sources of intelligence are not just cyberspace). They research the backgrounds of senior people in companies, identify technologies and vendor vulnerabilities, conduct anti-forensics, and manipulate antivirus programs. They avoid using rootkits, which might reveal their identity and location; and they use encryption. Their tools are the standard tools in mainstream use (e.g., keystroke loggers, rootkits, spam, spyware, Trojan Horses, viruses, and worms) their cyber tools do not require huge dollar resources for weaponization, unlike traditional weapons. Delivery is equally simple—via electronic mail and software vulnerabilities, which is perhaps the most significant. How do we improve on the quality of our software; how do we make sure there is no malicious code in it? We need to ensure not only the quality of the software but also its pedigree. With instant messaging, network shares, Internet Relay Chat (IRC), and Bluetooth, access to your computer requires minimal investment.

THREAT MODEL

The traditional threat model defined in the national intelligence estimate—a set of 7 to 10 threat organizations—needs to be changed. Today, a number of categories apply (Table 1). The last item in Table 1, the nation states—can have a tremendous impact through cyber terrorism on critical infrastructures—the systems that control our dams, hydroelectric plants, telecommunications, and financial networks. For example, we need to examine what would happen if someone were able to disrupt the processing of checks. Significant attention needs to be paid to the cyber security of the financial system of the U.S. Look at what terrorists targeted on 9/11 at the World Trade Center. Some people believe they were targeting an icon, something that represented America. They also were going after Wall Street. They really want to collapse—to crash, if you will—our financial system.

Table 1 Maturing Threat Model

Old Threat Model	Redefined Threat Model
Traditional foreign intelligence organizations Nontraditional organizations Insiders Hackers Developing nations Terrorists Criminal elements	Kiddie Hackers Big splash/thrill seekers (braggers) Malicious intent (troublemakers) Criminal element (monetary gain) Steal money Steal intellectual property Blackmail/extortion Industrial espionage Terrorists SCADA SWIFT Financial Icons Nation states Military targets/financial/political

What have we done to prepare for cyber warfare? What are some opportunities to really prepare for the battle in cyberspace? The first step is the National Strategy to Secure Cyberspace, which the President signed in 2002 and released in 2003. It is a good strategy that covers the waterfront; but it has to be more directive and updated to specify not just what we should do but what we will do. Dennis Fisher[2] has said that, "In fact, very few of the provisions in the strategy have been implemented in any meaningful way, and every man who has followed Clarke has ended up leaving in frustration over the government's seeming indifference to information security issues." We have not done much to implement that strategy. Homeland Security was given a significant role in this particular area but never was resourced to do it. Its focus was on the physical things such as port security, aviation, and weapons of mass destruction rather than the cyber arena.

"With instant messaging, network shares, Internet Relay Chat (IRC), and Bluetooth, access to your computer requires minimal investment."

The U.S. Computer Emergency Readiness Team (US-CERT) has made some significant strides in incident management. When you look at critical infrastructure and key resources, which are the main responsibilities of DHS, cyber security is the main connector in the network of those resource and infrastructure elements.

NSA focuses on DoD because of its funding and its organizational constructs. It does have a larger role, National Security Directive-42 (NSD-42), which states that NSA is responsible for information assurance for the nation; but it was never funded. NSA has the largest cadre of the best information assurance experts in the world. We should make use of those in terms of how to protect our networks.

[2] Dennis Fisher, "White House Cybersecurity Strategy Running Short on Time," 15 February 2007, SearchSecurity.com (http://searchsecurity.techtarget.com/columnItem/0,294698,sid14_gci1243849,00.html)

DoD works primarily to protect its own networks, which are interconnected. So if there are problems with the DoD networks, there will be problems in other networks, too. As General Cartwright mentioned, one of STRATCOM's roles is cyber security, primarily for the Global Information Grid and to assure net-centric operations in DoD missions but not necessarily for the entire country. What does that mean in terms of STRATCOM's role versus the role at DHS? Discussions on this topic continue. The intelligence community considers its networks to be somewhat protected because they are isolated and, consequently, has not necessarily made cyber security, information and collection a priority. It is a challenge to report cyber security intelligence information, but the intelligence community is required to participate in the information sharing environment by the legislation for the Director of Naval Intelligence (DNI), which mandates that we find a way to build a network and make sure that this type of information can be shared.

"We are focused on buying battleships rather than advanced IT; i.e., today's product versus future developments. We really do need to be more agile."

The commercial sector tends to stay in its own stovepipes with mixed success. Due to a concern for liability, the commercial sector does not readily share information. For the U.S. government, in general, there is no cyberspace governance; there is no overall plan to ensure cyberspace defense. It tends to be reactive rather than proactive, tending to focus on what is knows rather than what it does not know. Some cyberspace problems are viewed as too hard to approach. Our investment model is still in the industrial age rather than the information age. We are focused on buying battleships rather than advanced IT—today's product versus future developments. We really do need to be more agile.

Academia as well fails to focus on the harder problems posed by the threat. Academic research tends to focus on other priorities such as collaboration rather than security of academic networks.

The sophisticated adversary is not being addressed in academic research.

WHO'S IN CHARGE?

When something goes wrong in cyberspace or where there is a major event, whom do you go to? Do you go to STRATCOM? US-CERT? At one time, the National Security Council (NSC) was the focal point, prior to the formation of DHS. During the early cyber attacks, the NSC would convene a teleconference of 50 people from many different agencies. It is not clear what exists now in terms of the way that we structure our governance.

What constitutes an active act of cyber war? At what point do you declare that something bad is happening and you need to take action? There is no model equivalent to the law of the sea, which says if you attack, I will respond. On the asymmetric battlefield, hackers use the Internet as a resource. Hacker sites contain the scripts, techniques, and cookbooks that allow anyone to deliver their payload. They can publish hacking information faster than patches can be devised. Hackers have no moral limits. The U.S., conversely, with its laws and regulations, can debate for weeks whether or not to do something to a terrorist web site. Nation states have a different agenda than they did before; they have to prioritize targets and scale operations according to whether it is military, financial, political, or personal information to determine targeting and response. The military agenda may involve using cyber implants, putting something into your networks, to be used later for future combat. The persistent question is, "Are we alone on the SIPRNET; are there any bad guys in the SIPRNET?" A small group operating on this network could cause a significant disruption of military operations.

SOLUTIONS

At the top of the list of solutions is integrated leadership: we need to put somebody in charge. We need to work in the commercial world to make sure that information is shared about ongoing cyber activity across the various stovepipes. We need to update the President's National Strategy to Secure Cyberspace.

It was adequate for the situation when it was created in 2002, but we know more today than we did then. We need to institute a sharing mechanism for vulnerabilities, which means that we share information about threats so that people understand what the real threat is against their systems. The US-CERT has made some progress in setting up an information sharing environment. To coordinate that sharing environment, however, a cyber czar is needed. Participants in the system need a Ghostbusters contact: Who do you call when something goes bad?

To facilitate knowledge sharing, we need to establish a cyber academy, a center of academic excellence to train the next generation of cyber warfighters. How do we educate the people who are needed to operate in this particular environment? We need a systematic approach to instructional designs for teaching cyber countermeasures and defensive tactics. A cyber academy has been discussed, yet it still has not been established.

Congress needs to become engaged in pushing legislation that mandates and funds academic research. It is becoming a truism that protecting cyberspace requires an effort on the scale of a Manhattan Project. If so, we need to seek and appoint an Oppenheimer for the effort—leadership that will make it happen.

The following is a list of the hard problems that need to be addressed now but tend to be put off because they will require greater resources:

- Pinpointing attribution
- Identifying insider threats
- Understanding a sophisticated adversary
- Reducing noise in the system to filter out 90% of nuisance hacking
- Establishing persistent, continuous monitoring for anomalies by applying Artificial Intelligence techniques

Increasing public awareness is also part of the solution. We need to educate the public about protecting its own systems from cyber attacks. It is important for it to know that it needs to do more than buy virus protection software one time and forget about it. Constant updating and vigilance is needed throughout the public sector.

Providing incentives for American students to pursue computer science educations is a priority solution for the long term. As a reaction to the dot-com collapse, enrollments are down 30% at U.S. universities for computer science degrees. We need to convince American students that there are substantial career opportunities for computer scientists in the cyber security world.

The National Infrastructure Protection Plan (NIPP), which DHS released in December 2005, is a road map for how to protect the critical infrastructures key resources. Sector-Specific Plans (SSPs) are being prepared from 17 specific infrastructure sectors (e.g., water, agriculture, telecommunications). Each of these SSPs should have a cyber security component within the plan because computer networks are a critical component of its successful operations.

> *"There is no model equivalent to the law of the sea, which says if you attack, I will respond. On the asymmetric battlefield, hackers use the Internet as a resource. Hacker sites contain the scripts, techniques, and cookbooks that allow anyone to deliver their payload."*

The Information Technology sector must assess threats accurately through collaboration among the private sector, the DHS, and the intelligence community. That means specific requirements for collecting and sharing threat data must be established. The Homeland Infrastructure Threat and Risk Analysis Center (HITRAC) of DHS plans to provide specialized threat warnings, incident reports, strategic planning information, target selection matrices, attack-specific threat scenarios, and overall sector-specific threat assessments to public and private sector security partners in the IT sector.

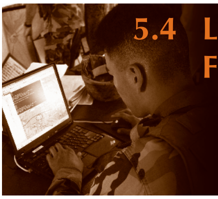
Because the Internet does not recognize international boundaries, we need to establish a mechanism for international cooperation in cyber security issues.

Software assurance is an essential part of the solution. We need development tools, evaluation techniques, and acquisition regulations to provide assurance that the software that is marketed is not corrupted. This may require some legal options to make companies responsible for bad code. It also requires having a reliable, consistent process for finding and fixing flaws.

Monitoring is an ongoing challenge that we must face from now on. We need to establish a national center along the lines of the roles the US-CERT and CENTCOM are playing to maintain persistent monitoring and to provide alarms in every device and application. This requires developing the cyber equivalent of the Distant Early Warning (DEW) line that would be enterprise wide, would have no physical or geographical boundaries, and would be able to analyze alarms anywhere in the world in microseconds.

CONCLUSION

The conclusion is not upbeat. We are now actively engaged in an active cyber war, whether we realize it or not. In some respects, the U.S. is still waiting for a great cataclysm like Pearl Harbor on the cyber front before responding; but it is already happening. We need to realize that. Our adversaries are very active, both individuals and organizations, so need to increase our activity in accordance. Most importantly, we are lacking clear governance; and we need to have someone in charge of cyber security.



5.4 LEAD-TURNING THE 21ST CENTURY FIGHT: CYBERSPACE

Steven McPherson

INTRODUCTION

This article presents a condensed version of the Air Force's Cyberspace Task Force activities. In December 2005, the Air Force issued a mission statement, stating the Air Force would fly and fight in airspace and cyberspace. In January 2006, the Secretary of the Air Force and the Chief of Staff of the Air Force established a task force to accomplish those missions. This article addresses the major challenges the Cyberspace Task Force faces in leading the transformation of warfare into the 21st century. Consisting of 12 people from various backgrounds and perspectives, the Cyberspace Task Force has been under way for more than a year and has clocked more than 12 thousand hours of flight time. This article is titled, "Lead-Turning in the 21st Century Fight" because it provides a strategic perspective on the cyberspace challenge as an issue for the U.S. to address not just in crossing the threshold of the 21st century but in remaining as a world power into the 22nd century.

Col. Steven McPherson, Deputy Director, U.S. Air Force Cyberspace Taskforce. Colonel McPherson has served the Air Force for more than 30 years after earning his Bachelor of Science. He has served as the deputy commander of the 318th Information Operations Group, commander of the 23d Information Operations Squadron, operations officer and commander of the 11th Bomb Squadron—the B-52 Formal Training Unit, Persian Gulf branch chief on the Joint Staff (J-5), the director of the Air Force Tactical Doctrine Center, a B-52 flight examiner, and instructor radar navigator. He is a B-52 Weapons Officer and a Master Navigator with over 2700 flying hours in multiple aircraft and 163 combat hours in the B-52 during Desert Storm.

This paper focuses on the following four major challenges:

- Defining the concept of cyber, putting it into a context that allows us to specify how we discuss and reference it.
- Diagramming cyber as a domain, including a wide range of perspectives on what the domain includes.
- Refining the concept of cyber warfare, which definitely relies on a clear understanding of what the domain is.
- Establishing cross-domain dominance, on which the Cyber Task Force has focused its development efforts.

> *"The sea domain is easy to conceptualize because we can touch it. The air domain is a bit harder to see, but we can breathe it. However, when something is composed of elements, waves and rays it is difficult to think of it in the context of a domain."*

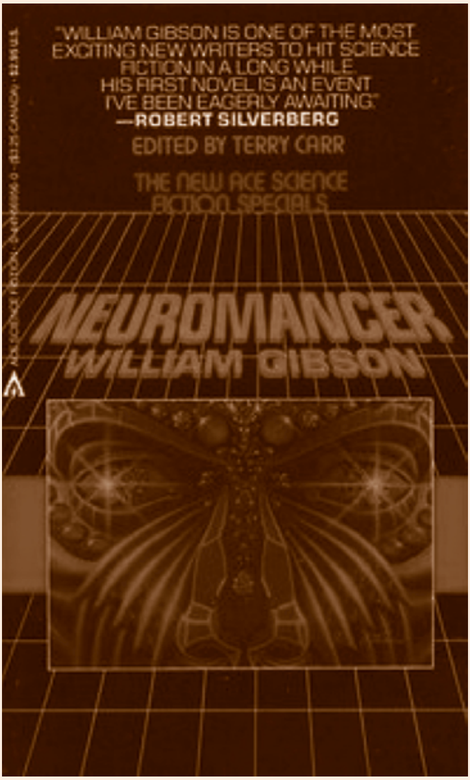
DEFINING CYBERSPACE

A major hurdle in dealing with the concept of cyber is understanding the popular cultural aspects of the term, encompassing not only the latest developments on the Internet such as the virtual realms of MySpace and YouTube but also the entire spectrum of activities throughout global online networks and the "World Wide Web." Most of us are familiar with the word cyberspace referring to this online environment; but its definition may seem problematic when you consider its original genesis. William Gibson coined it in his 1984 futuristic novel, *Neuromancer*, referring to cyberspace as "a consensual hallucination" (Figure 1). It proved a bit difficult for the Cyberspace Task Force to include in its mission statement that the Air Force will fly and fight in air and in space and in the "consensual hallucination."

“Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts . . .

A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding . . .”

William Gibson, *Neuromancer*, 1984

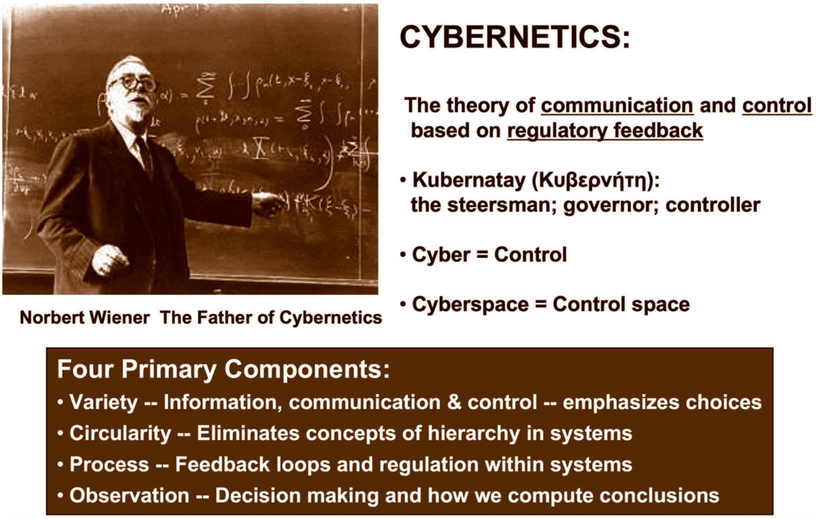

"WILLIAM GIBSON IS ONE OF THE MOST
EXCITING NEW WRITERS TO HIT SCIENCE
FICTION IN A LONG WHILE.
HIS FIRST NOVEL IS AN EVENT
I'VE BEEN EAGERLY AWAITING."
—ROBERT SILVERBERG
EDITED BY TERRY CARR
THE NEW ACE SCIENCE
FICTION SPECIALS
NEUROMANCER
WILLIAM GIBSON

With *Neuromancer*, William Gibson introduced the world to cyberspace — launching the cyberpunk generation.

Figure 1 The Concept of Cyberspace

To put the term in a usable context, we have to understand the concept of cyber and review the origins of the term. When discussing how to conduct warfighting in this domain, it is important to define the term cyber in this context. For our definition, we need to go back to the derivation of the term cybernetics, expressed by Dr. Norbert Wiener, who is known as the father of cybernetics.

Those with a background in computer science are familiar with Dr. Wiener's work with control of antiaircraft guns during World War II and the genesis of his interest in communications theory that led to cybernetics. In 1945, Wiener contributed to the development of radar tracking and antiaircraft gun targeting technology. He developed computational methods that showed us how we could use radar not just to observe but also sense, track and engage them early enough and with sufficient information to predict their tracks and allow us to shoot them down. Wiener's work led to the ability to make computations, and provide feedback about changes in that track to adjust targeting. One of his greatest contributions was using feedback to enhance the ability to predict: You have to shoot—not where the target is but where the target is going to be. The critical elements were the ability to sense and track the target, achieve predictability, and the feedback capability to ensure that you could maintain track and predict the target's trajectory to finally aim in front of the target. These are the fundamental concepts driving our operations in cyberspace (Figure 2).



Norbert Wiener The Father of Cybernetics

CYBERNETICS:

The theory of communication and control based on regulatory feedback

- Kubernatay (Κυβερνήτη): the steersman; governor; controller
- Cyber = Control
- Cyberspace = Control space

Four Primary Components:

- Variety -- Information, communication & control -- emphasizes choices
- Circularity -- Eliminates concepts of hierarchy in systems
- Process -- Feedback loops and regulation within systems
- Observation -- Decision making and how we compute conclusions

Figure 2 The Concept of Cyber

The use of computers, is central to solving problems such as targeting; but it is not the only piece of the puzzle. We must consider many other elements to operate in the cyber domain.

THE CYBER DOMAIN

Table 1 shows an evolution in our thinking in the national security environment. In 2003, we were looking at critical information systems in the national strategy to secure cyberspace. That makes sense as an initial approach. However, as our thinking evolved, by 2006, cyberspace was a domain characterized by the use of electronics and the electromagnetic spectrum. The inclusion of the electromagnetic spectrum in the definition is fundamental because it now establishes a foundation in science and the applicable laws of physics, allowing predictability and repeatability as we work to develop warfighting capabilities.

Table 1 National Guidance and Expectation

2003	*National Strategy to Secure Cyberspace*	Protect against the debilitating disruption of the operation of critical information systems.
2004	*National Military Strategy*	Adversaries threaten the U.S. throughout a complex battle space . . . airspace, space, and cyberspace.
2006	*Quadrennial Defense Review*	Cyberspace is increasingly critical and inseparable from our national power and interests . . . It is appropriate . . . to develop both a cyber power and a space power theory.
2006	*National Military Strategy for Cyberspace Operations*	As a war-fighting domain . . . cyberspace favors the offense. • Offensive capabilities in cyberspace offer both the U.S. and its adversaries an opportunity to gain and maintain the initiative. • Cyberspace is a domain characterized by the use of electronics and the electromagnetic spectrum to store, modify, and exchange data via networked systems and associated physical infrastructures.

The Technology Is Not the Domain

Figure 3 illustrates two essential elements of the emerging Department of Defense definition of the cyber domain: the electromagnetic spectrum and the electronics required to control it. The distinction to make with Figure 3 is to differentiate the technology; and the domain. It is easy to link these elements and conclude that cyberspace is a manmade domain. On the contrary, electronics and the devices that use the electronic spectrum are manmade technologies to harness the energy that is in this domain. This is a difficult distinction to make because we currently lack an established foundation from which to build this concept of the cyber domain. The sea domain is easy to conceptualize because we can touch it. The air domain is a bit harder to see, but we can breathe it. However, when something is composed of elements, waves and rays it is difficult to think of it in the context of a domain.

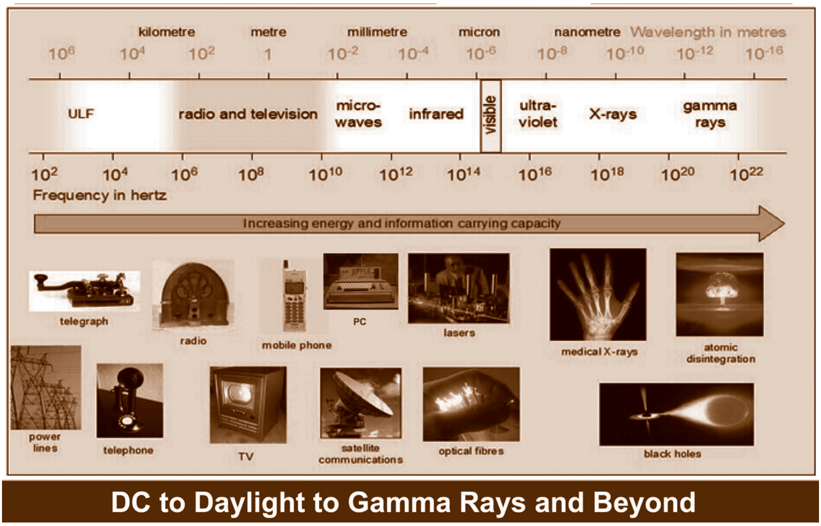


Figure 3 Electronics and the E-Spectrum

Figure 3 shows increasing energy as the spectrum moves to the right—increasing energy and information-carrying capacity. Historically, technology development initially focused on information-carrying capacity, all the way back to the use of the telegraph during the Civil War (the author Tom Standage refers to the telegraph as the Victorian Internet). To fully realize the potential of this domain, we have to consider the increasing energy as we move right on the spectrum, away from radio frequencies, and understand what can be done with that energy—lasers, directed energy, and high-power microwave. The Air Force is also including these technologies in its operations in the cyber domain—the electromagnetic spectrum. What is it that we want to be able to do? We call it effects-based operations.

Effects-Based Operations

We want to be able to achieve certain effects through activities across the electromagnetic spectrum. Recall that cybernetics includes awareness plus ability to track, make cognitive decisions, and control that energy, all of which are focused on accomplishing an objective such as targeting. Sense, signal, connect, transmit, process and control effects is essentially the construct of the Air Force's model for operating in the cyber domain. Figure 4 may help to clarify the difference between the technologies that enable the domain and the effects-based operations that go on in that domain; i.e., we need to distinguish between the domain capabilities and the technology developed to harness that domain. Therefore, as Figure 5 shows, the discussion about Air Force cyberspace is not focused only on information operations; instead, it is about understanding the domain in which information operations may be conducted. We may also conduct some of those operations outside the cyber domain. For example, distributing handprinted leaflets constitutes information operations; but it does not need to involve operations in cyberspace.

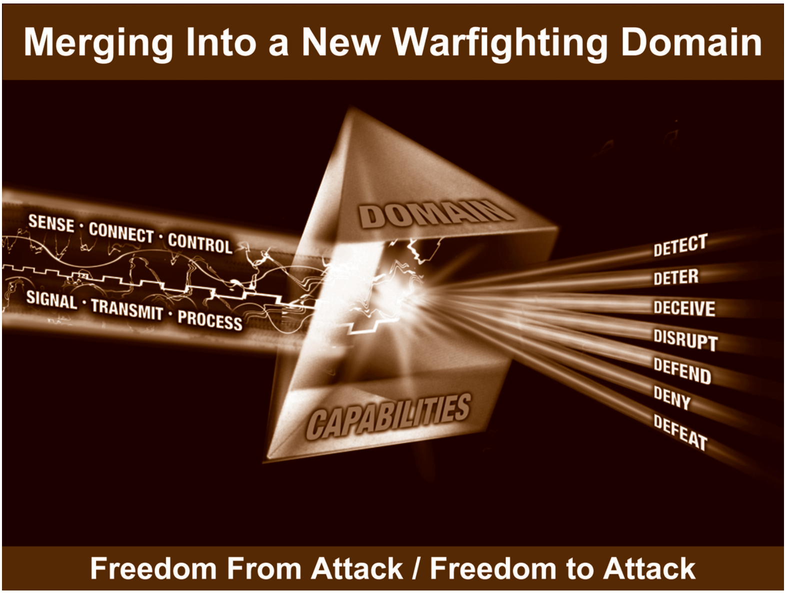

Merging Into a New Warfighting Domain
SENSE · CONNECT · CONTROL
SIGNAL · TRANSMIT · PROCESS
DOMAIN
CAPABILITIES
DETECT
DETER
DECEIVE
DISRUPT
DEFEND
DENY
DEFEAT
Freedom From Attack / Freedom to Attack

Figure 4 Merging Into a New Warfighting Domain

Another effects-based operation shown in the cyber domain in Figure 5 is command and control. Taken in the context of cybernetics—of being able to control the operations—integration of sensors will enhance situational awareness—and achieving predictability—allow us to be in place ahead of our adversaries. Finally, if necessary, electronic warfare through applied directed energy is very much an effects-generating capability to apply force against the adversary using the electromagnetic spectrum.

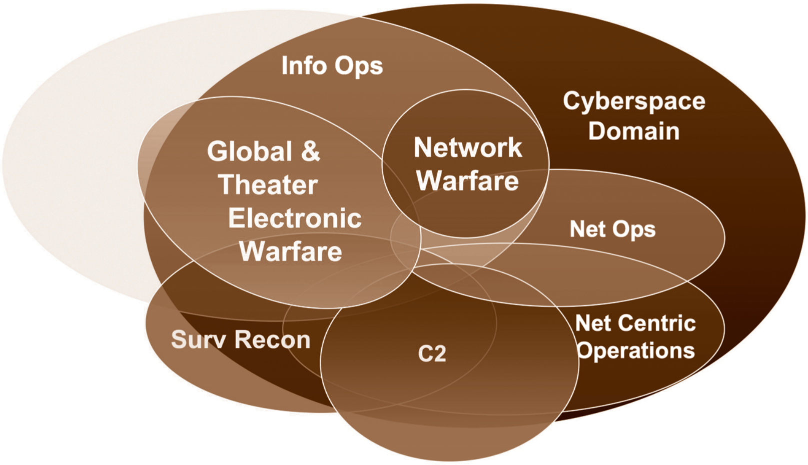


Figure 5 The Cyber Domain

Refining the Concept of Cyber Warfare

Figure 6 illustrates the concept of warfare in the cyber domain. The development of technology for the cyber domain in the 21st century is in many ways similar to the emergence of air warfare capability in the early 20th century. In some respects, we are at the same point of development in cyber warfare as we were when the U.S. purchased its first Wright Brothers Military Flyer in 1909. It began a technology evolution of adapting and equipping airplanes for warfare. The Army Signal Corps pioneers of the early Wright Military Flyers were not thinking about engineering the capabilities of an F-35 or F-22 at this point; they were just beginning to understand the technology that would take us there. They were trying to harness a new technology but had not yet fully explored and exploited the science and physics of operating in the air. Aeronautical science and advanced aerodynamics and engineering did not really take off until World War I. Air warfare had not yet benefited from the work that the airpower tactician, Colonel John Boyd, did in understanding the science of energy-maneuverability as a principle of operating in the air, which eventually led to the engineering developments of our fourth-generation fighter aircraft.

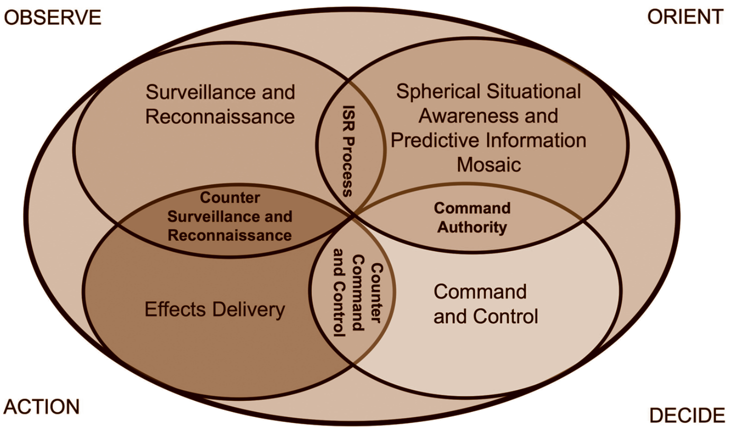

OBSERVE
ORIENT
Surveillance and Reconnaissance
ISR Process
Spherical Situational Awareness and Predictive Information Mosaic
Counter Surveillance and Reconnaissance
Command Authority
Counter Command and Control
Effects Delivery
Command and Control
ACTION
DECIDE

Figure 6 Concept of Cyber Warfare

Operational Warfighting Construct for the 21st Century

The pivotal point of the analogy to early 20th century air warfare is that operations in the cyber domain are just beginning to fit into an operational warfighting construct. We are still developing, for the cyber domain, the types of relationships that Boyd put forth concerning observation, orientation, decision, and action (OODA) and generating a rapidly changing environment to stay ahead of an adversary's capacity to adapt.

Returning to Norbert Wiener's cybernetics, which provides processes to ensure we have complete awareness, observability, and collection capabilities to know what our adversaries are doing, Figure 6 illustrates how we must be able to perform the cognitive processes that provide complete spherical situational awareness and a predictive capability that lead to decision and action. As Figure 6 shows, we need to know where the adversary is; we need to be able to track him and to get out in front of him. Then, we want to make sure we have complete and dynamic command and control with a continuous feedback loop to deliver effects. The process allows one to operate in a swarm-like manner, similar to the way hornets are able to work together to pursue someone who has disturbed their nest.

Figure 7 shows a mode of operation that is dynamic like a hockey game: it is a continuously adaptive environment, in which one attacks the adversary, loops back to acquire more information, and returns to attack again from a different angle. That is the basis of conducting cyber warfare: developing a dynamic environment in which you can predict what an adversary will do.

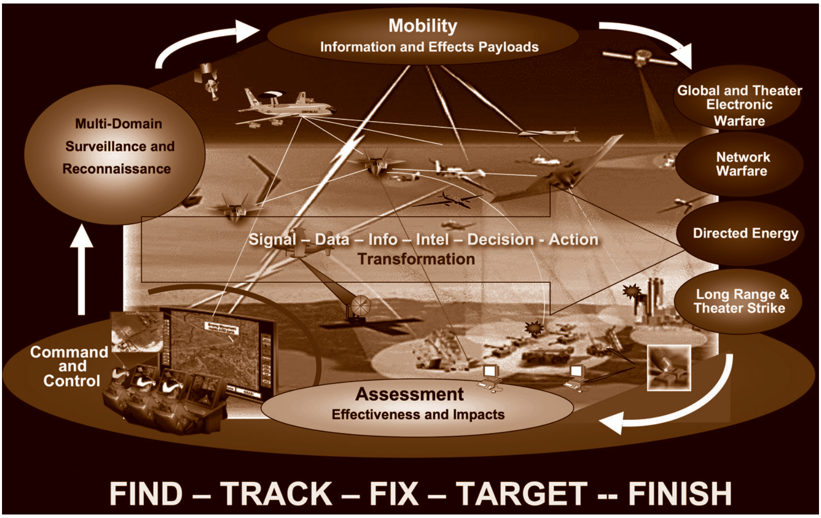

Mobility
Information and Effects Payloads
Multi-Domain Surveillance and Reconnaissance
Global and Theater Electronic Warfare
Network Warfare
Directed Energy
Long Range & Theater Strike
Signal – Data – Info – Intel – Decision - Action
Transformation
Command and Control
Assessment
Effectiveness and Impacts
FIND – TRACK – FIX – TARGET -- FINISH

Figure 7 21st Century Operations Concept

Force – Counterforce

The obverse aspect of cyber warfare is that the adversary can have these same capabilities. In the cyber warfare construct, the objective is to minimize the action rate while also anticipating the adversary's response time and OODA loop so that it becomes obvious, allowing one to constantly stay ahead of the adversary.

Warfare in the cyber domain demands a different type of thinking about warfare, although it still ends up with the application of force. It requires a totally different target set. As we move into the 21st century and warfare in the information age, we need to understand what this construct looks like on the operational battlefield. It requires multidomain surveillance and reconnaissance; i.e., not just reconnaissance and awareness within cyberspace but also understanding what is going on in all domains. It requires the ability to transport not just information but also to deliver effects payloads. It requires the ability to act against the adversary and to apply effects whether they consist of electronic warfare, network warfare, directed energy, lasers, high-powered microwaves, the force of TNT-based payloads, or a combination of payloads. To integrate and fuse all of these capabilities, assessment through a reliable feedback loop—accomplished in and through the cyber domain—is critical to a dynamic command and control. The same construct's operatives in industrial warfare apply to cyber warfare: strategic attack and the ability to penetrate the adversary's capability to make war.

Throughout most of the 20th century, we have had a tritenol-based (i.e., a TNT-based) warfare strategy: we blow things up. That leaves us with a lot of rubble to clean up and an infrastructure we need to repair and replace when the conflict is over. It also gives us a one-vector capability. To deliver effects, we must first apply force through the energy of TNT and then hope to achieve the effect. That limits us to having to first destroy an objective to secondarily disrupt, deny, delay, deter, and deceive. In the cyber warfare construct, the objective is to provide options to detect, deter, and deceive, disrupt, and deny without necessarily destroying. For example, if an adversary needs to transport any of his physical warfare capability to progress with the conflict, we want to be able to disrupt his ability to transport that material, not by destroying railroad lines or the physical communication infrastructure but by simply disrupting his ability to use those lines of transport and communication. The same principle applies all the way across the board: it provides alternatives to destroying and to disrupt, deny, delay, deceive, and deter. I call it the alternative energy option to operate militarily in the 21st century because finding alternative energy sources is a priority for this century. Cyber warfare provides an alternative energy domain beyond using TNT in warfare.

CROSS-DOMAIN DOMINANCE

Figures 8 and 9 emphasize the need to apply the principle of dominance and superiority not only in the three dimensions of air, space, and cyberspace but across all five domains (land, sea, air, space, and cyberspace) to deliver effects. At the beginning of World War II, the Germans combined air and land operations in the Blitzkrieg; the Japanese combined air and sea operations and delivered a powerful assault on the U.S. at Pearl Harbor. Obviously, after the U.S. experienced these types of attacks, we began to analyze them and figure out how to counter them. Ultimately, we ended WWII with an understanding of cross-domain dominance. For the 21st century, the U.S. needs to apply that kind of will power to improve our ability to anticipate and counter the threats of cyber warfare. The new cyber warfare construct brings all of the capabilities listed in Figure 8 and shown in Figure 9 so we can synergistically deliver effects against our adversaries. It requires not only operating at the speed of sound but also conducting those operations at the speed of light.

- **Air, space, and cyber superiority is achieved through control of all three domains. An integrated cross-domain strategy is crucial to gain true superiority.**
  - **Cyber-based attacks against enemy centers of manufacturing, production, distribution, etc.**
  - **Preemptive destruction of enemy cyber capabilities prior to effective enemy employment**
  - **Proactive response against employed opposing cyber capabilities to achieve objective of ongoing operations**
  - **Cyber-based attacks to deny or inhibit enemy mobility or transportability**
  - **Direct attack to co-opt, control, or deny enemy defenses**

In cyber as in the air, absolute superiority is the goal. Control of the domain is the first battle of any future war.

Figure 8 Concept of Cyber Warfare

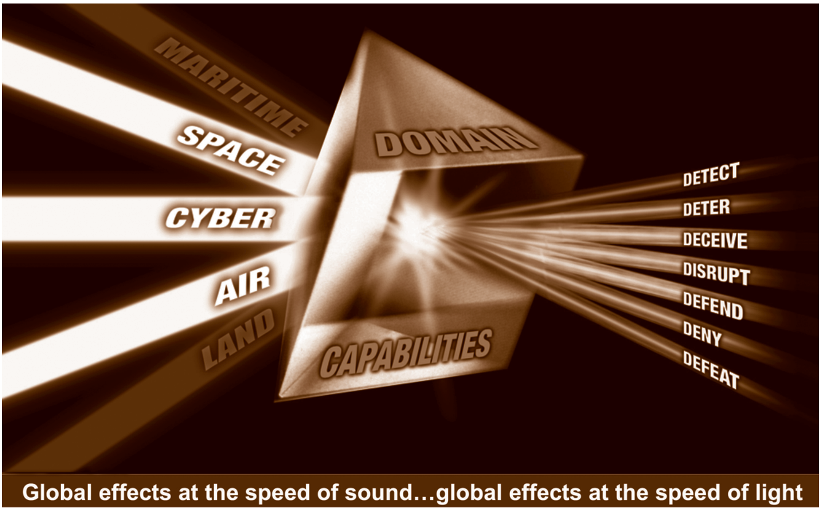
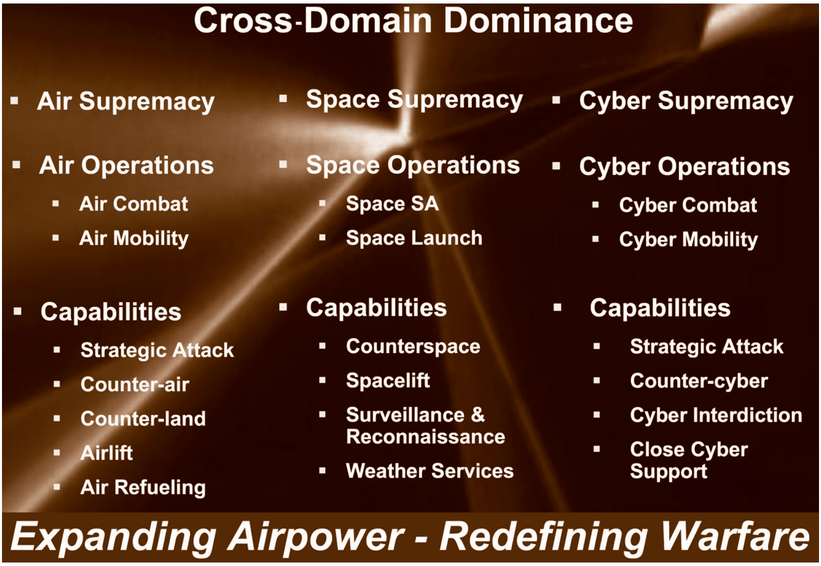


Figure 9 Threshold of Cross-Domain Synergy

The mission of 21st century warfare consists of the same objectives and operations we have always pursued, but the challenge is understanding how to achieve them in this new and emerging domain. Warfare still relies on range and payload; delivering effects; and finding, fixing, and finishing the adversary; but the new challenge in the 21st century lies in fusing and integrating cyber capabilities and understanding how to use them not just as enablers but also as force-application capabilities. Figure 10 summarizes how we must redefine the Air Force for the 21st century so that we have airpower supremacy through air operations, space operations, and cyber operations as a collective cross domain dominance.



Cross-Domain Dominance

- Air Supremacy
- Air Operations
  - Air Combat
  - Air Mobility
- Capabilities
  - Strategic Attack
  - Counter-air
  - Counter-land
  - Airlift
  - Air Refueling

- Space Supremacy
- Space Operations
  - Space SA
  - Space Launch
- Capabilities
  - Counterspace
  - Spacelift
  - Surveillance & Reconnaissance
  - Weather Services

- Cyber Supremacy
- Cyber Operations
  - Cyber Combat
  - Cyber Mobility
- Capabilities
  - Strategic Attack
  - Counter-cyber
  - Cyber Interdiction
  - Close Cyber Support

Expanding Airpower - Redefining Warfare

Figure 10 21st Century Global Reach/Global Power

These objectives require strategic and operational synergy across the entire electromagnetic spectrum and throughout all warfare domains, with the ultimate result of defending against and defeating our adversaries. We must redefine warfare by using all of the resources of the cyber domain to continue to win and continue to secure and perpetuate the freedom and justice upon which our nation is built.

5.5 QUESTIONS AND ANSWERS HIGHLIGHTS

Transcripts

Q: *Because the preceding presentations give such a gloomy view, I will pose an angel's advocate question for Jim Gosler and ask, how serious is this really? After all, the terrorists could have used the Internet to take down the banking system, but they blew up the World Trade Center instead. They were unable to use their intelligence to prevent us from kicking them out of Afghanistan. Do we really have to do something right now, or when do we have to do it?*

Mr. James Gosler – My focus was primarily a near-peer nation-state adversary, not a terrorist organization. I believe that a terrorist organization could play a percentage of the game I have outlined. I think it would be difficult at the scale I tried to convey, however. The problem that I have with the near peer is he has the spectrum of capabilities, the wherewithal, and the motivation to cause serious harm in our ability to project military force in the world. If you cascade that down, what are the consequences of his knowing that we may not be able to do that? The impact of that is huge. It pertains not only to the projection of military force; it applies across everything within our country that we depend upon such as Wall Street. A terrorist organization, I think, could cause us significant damage in a tactical situation, at least today. Over a period of time, I think that will change as our adversaries gain a clearer understanding of the utility of these tools.

Q: *Can you elaborate on the kinds of responses we are considering for large scale systems attacks?*

Mr. Daniel Wolf – There are ongoing activities that are significant in terms of the levels of sophistication. They target specific types of information, specific organizations, specific people; and they are relatively successful in terms of extracting information. The defense is very active; however, the defense ends up one step behind because today's sophisticated hackers have a wide set of tool kits. So, as the defense closes down one particular way they can extract data, they activate something else. It is a continual challenge.

Q: *Are there any other responses besides in-kind; in other words, can you do a military or diplomatic response to a nation state? If we can attribute—or at least we have some certainty of attribution—can we make a non-cyber response? What would be the decision criteria involved in doing that?*

Mr. Daniel Wolf – There is a DoD document that talks about response in the Computer Network Defense CND arena, an active response. A set of criteria was established for the type of situation where somebody is intruding into your systems, so what are your options? Obviously, you can change the settings on your ports, your firewalls, and things like that. That is a local decision. When you go out on the network and start to do things, it escalates in terms of the level of decision-making. At the point where you are going to go into a foreign country and do some "damage" in its networks, that's a fairly high-level decision.

Q: *How is the Air Force cyber effort going to be connected with the other Services and connected to the intelligence community?*

Col. Steven McPherson – Full integration would be the answer to that because that is going to be critical to having effective capabilities. I think the Air Force is realizing we are on the verge of a potential World War III and the cyber Pearl Harbor. When those things happen, all heads are going to turn to the Pentagon for an effective response. The Air Force is working to posture itself so that we will be able to have an effective response. That response may go well beyond just a mere localized tactical capability. That's what the Air Force is focused on right now; to ensure that it can organize, train, and equip forces to be ready to provide an effective capability when called upon.

Mr. Daniel Wolf – I would like to add to the answer to that previous question about our response options. I focused also on the defensive posture in terms of what you can do, both in terms of CND, the classic definition of computer network defense, and then the active response. Again, there are a number of terms that we use. From a military perspective, I would also say that you do have the options in terms of computer network attack (CNA). For that option, you need to look at who the adversary is. As I said, attribution is probably one of the tougher problems that you have. There could be a measured response in terms of military action such as a CNA action if it was serious enough; but that would have to be calculated very carefully.

Q: *There are a number of questions I am going to group together and let Jim start. They address the issue of what ought to be done to our networks and/or to providing anti-tamper for the electronics to our military systems. Consider the idea of putting UAVs in the air for a month at a time. What would prevent somebody from hacking into that control signal and taking over? What can be done technically that you can talk about?*

Mr. James Gosler – The world of anti-tamper, I think, is very important in this business. One of the challenges is that we need to have pretty good confidence that, prior to applying the anti-tamper technology to the component or system, it is trustworthy. When you look at the full spectrum of approaches that a sophisticated adversary has to affect your system, if he has done that before, because you have acquired parts or software to integrate into a bigger system from offshore, you apply the anti-tamper technology; you are sealing in the bad guy. He is already inside your perimeter. A standard problem that people have is they think that the attack for connected systems consists of a bad guy out here who is going to go through ports to get into your system. If you look at it across this full spectrum of offensive capabilities and approaches, including spies and people who are working on your behalf in some capacity, you have to get the technology and the trustworthy position to begin with, which is daunting; and you have to keep it that way through the life of that system. You design your architectures so that you understand what you are trying to protect. Are you trying to protect confidentiality? Are you trying to protect availability? There is a conflict between those two in general. The important question is, where do you want to put your emphasis? In many cases today, I believe, it is the availability, where a lot of our thinking is obsolete. It is all about confidentiality. These systems have to work. I would actually let the bad guy have insight into what is going on because I do not believe he will be able to react quickly enough to hurt me; but if I do not have the dependability of those systems working for me, I am in trouble. Availability and integrity become critical in that case. Anti-tamper is a necessary condition, but it is not sufficient. I believe a lot of research needs to be put into that.

Mr. Daniel Wolf – To follow up with the anti-tamper subject, I think we have matured our thought processes in IA to add persistent monitoring. If you have a device that has anti-tamper in it, you also should monitor it's performance: Is it operating in the envelope that you expect it to be operating in? I think persistent monitoring is something that we need to think more about. You can check software; you can do the quality control on software and spend a lot of effort on that. In some ways, it may be better to spend less effort in terms of checking the software and building the envelope around it to look at how it is operating and look for those anomalies. That may be a more effective way of doing things.

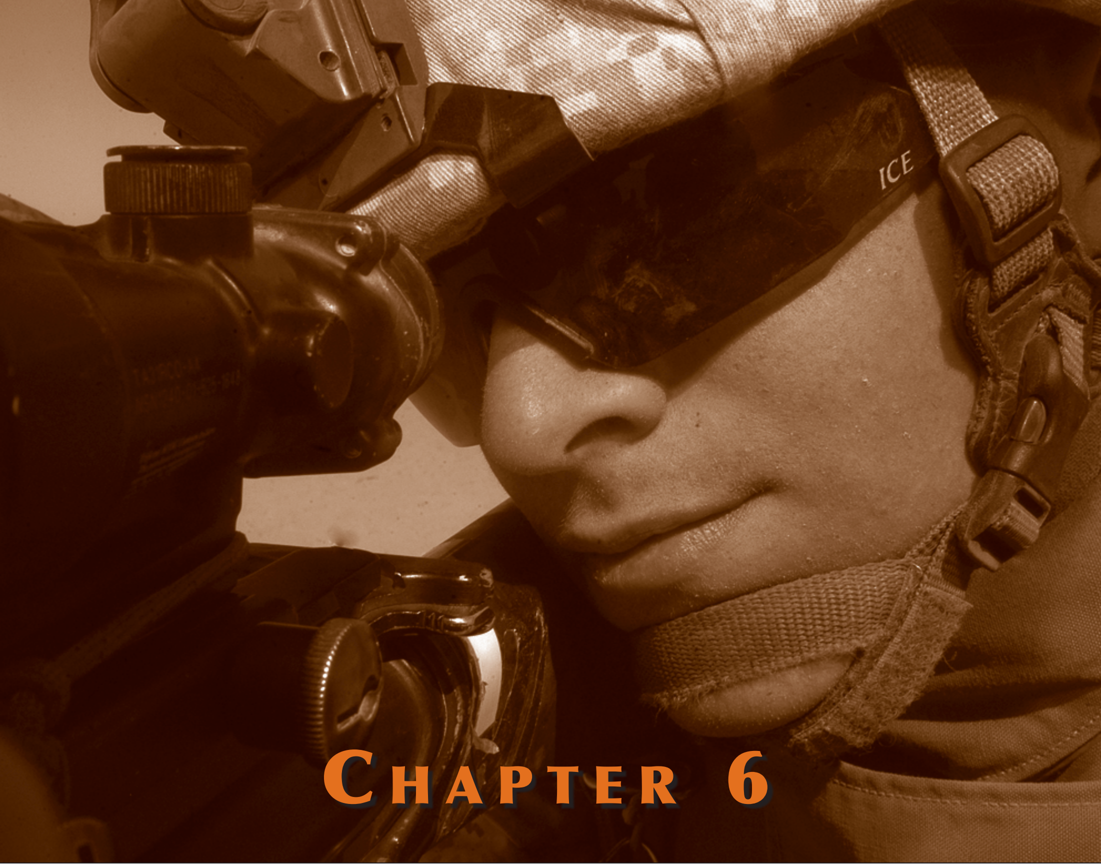
Q: *Do you have anything to add from the Air Force perspective?*

Col. Steven McPherson – I am not the technical solutions guy, but I am concerned with the operations solutions; and that is definitely going to pose a problem. Our framework is three-fold as opposed to binary. We look at security; we look at defense; and we look at offense. Security is a foundational piece; it is part of the infrastructure. I would see this as fitting into the secure infrastructure and as definitely critical. It is the foot planting; we use a model of the knight with his shield and sword; he has offense and defense in his hands, but it is that infrastructure foundation of security that he stands on to fight. What is going to be critical for us is dealing with those situations when they do come and having the continuity of operations to work through those situations and continue to have operational effectiveness. That is what we are going to have to deal with.

Mr. James Gosler – Three more quick comments about what you can do: the first two come up quite a bit in a lot of recent Intelligence Science Board and Defense Science Board activity I am engage in. The first one has to do with reducing unnecessary functionality in critical components. The unnecessary functionalities in these systems are a haven for potential bad behavior for subversive processes; i.e., to hide undetected until a time of the adversary's choosing. Another is trying to design into mission-critical applications war reserve modes that do not have single points of failure so if a bad guy gets in the routine component or system that you are working with in peacetime, you need to make it difficult for him to figure out how to gain access a second time. The third overall idea in terms of what you can do to better manage this we have discussed before; that is, the innovative use of offensive capabilities to support defensive objectives.

Q: Regarding Dan Wolf's comments about the terrorists wanting to take down Wall Street, that very well may have been the intent of the attacks because a significant number of personnel in the Twin Towers actually were involved in executing the transactions that kept Wall Street going. That leads into the next question, which is an aggregate: How would you go about organizing a national response; and if you are going to impose this requirement to defend an industry, how are you going to get it to pay for it? How are we going to get the banking industry to share with other industries what it is that we need it to do?

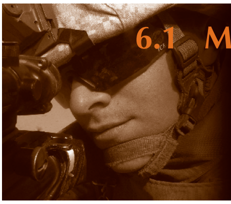
Mr. Daniel Wolf – That is the usual question. When you talk about imposing regulations on industry, it immediately turns around and want to know who is going to pay for it. What you describe is a real challenge. In a number of cases, we basically write off the legal responsibility for companies. I think that needs to be changed. There are certainly things in some of the recent legislation where corporate executives are responsible for security, and they need to do due diligence. I think defining a set of standards, a set of architectures, and a set of protocols and then putting those into regulations so that the financial industry has to maintain those and certify that they are abiding by them is maybe the way to go. If I looked at networks in the U.S. and asked what are the most secure networks, I am not sure I would say the intelligence community; and I am not sure I would say DoD. I think I would go back to the financial networks. Again, that is because, when something goes wrong, they have lost a billion dollars; it is something that you can put a price tag on. The financial networks are pretty secure; the protocols that they are using in some cases are a little dated; that is an advantage in a way because—it goes back to my kiddie hackers—I should not pick on the kiddie hackers all the time—but they are not that familiar with the protocols. There are some unique things that the banking industry is doing to ensure the security of its networks and the financial transactions.



Chapter 6

TECHNOLOGY ROUNDTABLE

URW in the Physical Domain



6.1 MODERATOR'S SUMMARY

José Latimer

INTRODUCTION

The focus of this panel is URW in the physical domain; specifically, technologies for communications, threat detection and mitigation, reconnaissance, force protection, and general warfighter support in non-traditional combat environments that are full of very asymmetrical threats. Our panel of technologists present perspectives of physical domain developments in key URW areas, including some capabilities already embedded in the Iraq theater.

A repeated theme in the technology realm is the deficiencies in the DoD acquisition loop. The loop will never match the dynamic nature of the threat—the threat overtakes events before requirements specifications can be written to bring solutions to the field. We need an acquisition strategy that provides a rapid and cost-effective, 80% solution, which yields operationally effective technology-based capabilities to the warfighter that are operationally effective in unconventional warfare. Another issue

Dr. José R. Latimer is the Business Area Executive for the Homeland Protection Business Area at The Johns Hopkins Applied Physics Laboratory (JHU/APL) and is a Managing Executive in the National Security Technology Department. He has managed and technically led as a program scientist, manager, and line supervisor, the design, development, installation, and performance assessment of various sensors and data acquisition instrumentation systems. He has more than 20 years of distinguished service with JHU/APL and holds a B.S. in Electrical Engineering from Villanova University, a joint M.S. in Biomedical and Electrical Engineering from Carnegie Mellon University, and a Ph.D. in Electrical Engineering from Catholic University.

we address is how to design concepts and tools that will keep us ahead of the enemy and able to counter threats while tapping our technology resources effectively.

The panelists represent leaders in the area of technology development and use, including technologies that will enhance efforts in the strategy and analysis communities as well. The first speaker, Mr. Jeffrey David, Deputy Director, Combating Terrorism Technology Support Office (CTTSO), presents the technical and programmatic execution of the Interagency Technical Support Working Group (TSWG). The TSWG conducts national research and development programs for controlling terrorism, and is the nation's forum to identify, set priorities, and coordinate interagency and international research and development (R&D) requirements for combating terrorism. The TSWG facilitates the rapid development of technologies and equipment to meet the high priority needs of the combating terrorism community and addresses joint international operational requirements through cooperative R&D with major allies. CTTSO focuses on technologies that dissuade, attack, and defend against URW threats.

Mr. David describes his position as the nexus of policy, technology, and operations. Technology development cannot take place in the absence of understanding of policy or operations, but technology will not solve the URW problem. URW must be defined before effective technology programs are designed to counter it. To fight an unconventional enemy, we must understand it. This enemy will do everything in its power to kill us. We must ask: What should we do differently today to prevent an undesirable terrorist outcome? We need to decide who is responsible for developing the technology. Efforts are fragmented because different agencies focus on diverse aspects of the problem. For example, DoD is concentrating efforts on IEDs; DHS is focused on transportation and border security.

In reality, our government must be restructured to fight this enemy. We need greater flexibility in allocating resources. We need better education and training. We need to assimilate what our international partners are doing to fight URW. The way forward requires change in four areas:

1. Defense organizations must demonstrate agility in R&D, providing resources, capability development, and engagement in DoD acquisition to bridge the gap between technology development and transition to the warfighter.

2. Interagency cooperation and collaboration must leverage R&D, available technology, skills, and capabilities to protect our borders, national infrastructure, and transportation systems.

3. We must implement a new National Security Act for the 21st century.

4. We must learn from, and enable, our international coalition partners.

Our next panelist, Mr. Bennett Hart, is a member of the U.S. Air Force Senior Executive Service, currently serving with the Joint IED Defeat Organization (JIEDDO). He describes how JIEDDO is moving from defense to offense, not only in Iraq and Afghanistan but worldwide. Our enemies are adept at using technology and circumventing our defenses. The range of technologies being used to counter IEDs goes from jammers to armor; but the enemy keeps getting more sophisticated, thwarting our efforts. He uses high-power wireless phones that cannot be jammed and pressure plates and command wire to detonate IEDs. Every technology put forward to defeat IEDs is quickly countered by the enemy. He is passing the information around via the Internet. To be effective the supply chain for IED manufacture, delivery, and employment must be identified and effectively eradicated.

IEDs are only one of the challenges we face in the technological battlefield. To counter URW we must have training on the latest tactics, techniques, and procedures used by the enemy. We need to be able to analyze the enemy's networks to identify similarities in technologies and tactics among various insurgent groups.

Models and metrics are needed to determine what is meaningful, what to attack technically, and how to target it effectively to thwart threats. Success will require the cooperation of every agency and organization.

From the battlefields of Baghdad, we then look internally at how technological development can defend the homeland. Mr. Tim Healy, Chief of the Intelligence Branch of the FBI in the Washington Field Office, reflects on the response from the FBI and other government agencies to 9/11 from a technology perspective. Mr. Healy gives an example of the power of technology with an anecdotal description of the FBI's initial response, moments after the first strike on the World Trace Center. The Bureau initiated a web page that enabled citizens to provide leads and information about the source of the attack. This simple use of the Internet and rapid deployment led to a highly effective tip-generating resource that demonstrates an action-oriented solution, utilizing resources quickly when and where they were needed.

As a result, the FBI developed the National Crime Information Center (NCIC) database, which combines data from the FBI, CIA, the State Department, and state and local agencies with connectivity to every law enforcement office, every Customs border agent, and everyone within the State Department and the FBI. The data are passed to the State Department's Consular Lookout and Support System (CLASS), which matches them against individual visa applicants. The data are sent to the airlines for their no-fly lists. The data can be accessed by state and local law enforcement for routine checks. The FBI tipline gets 140 hits a day, half of which are positive for known or suspected terrorists in the U.S. Many of the tips are the result of routine traffic stops. These statistics reflect a sobering reality—it is clear that the fight is here in the U.S.

The final panelist, Dr. Brian Pierce, Deputy Director for DARPA's Special Projects Office, describes URW as a complex, multidimensional problem crossing the entire landscape. Dr. Pierce explores the dilemma of how to address operations in all those dimensions, where using the same tactics the enemy uses does not win the peace. A subtler and farseeing strategy is needed—the basis of this strategy is "perfect cognition." Pierce defines "perfect cognition" as instant, intuitive understanding of a situation or environment. This is the only way we can understand how URW is going to be used against us because our adversaries have the home field advantage.

The challenge to technologists is how to help our warfighters achieve perfect cognition so that they can handle sudden emerging threats. One way to characterize a threat is to calculate its Figure of Merit (FOM). Greater awareness reduces the FOM, where perfect cognition is the ultimate awareness. Proactive, perfect cognition of a threat avoids a reactive response. In short, find the bomber, not the bomb.

We have to understand the human terrain to understand URW. We need analytical methods and display techniques to help us achieve perfect cognition. DARPA has developed a system dynamics model that establishes a structure of cause and effect relationships, converts them to equations, validates them against actual data, and uses them to ask what-if questions. This model can be used to identify intervention points that might be key drivers of the enemy's URW system. The model-provided broad but comprehensive perspective of the situation, and can be used to guide where to direct technology developments.

Integration of analytical data and strategic concepts used to design technology solutions in a rapid acquisition environment is integral to combating URW in the physical domain. Even in the technology realm, it is not a simple matter of tools and systems, but the integration of concepts and development that takes into account human factors, socialization, intuitive cognition, and predictive modeling.

Chapter 7

Senior Perspectives

7.1 UNRESTRICTED WARFARE—SENIOR PERSPECTIVES

Eric Olson

INTRODUCTION

I am happy to be here to talk to you about unrestricted warfare. I have been on the front lines of trying to define what kind of battle we are in—whether irregular warfare, insurgency warfare, guerilla warfare, or unrestricted warfare. I represent the United States Special Operations Command, one of nine unified combatant commands in the Department of Defense inventory. We are the command that has been charged by the President, via the Unified Command Plan, to serve as the lead combatant command for planning, synchronizing, and, as directed, conducting Department of Defense activities against terrorists and terrorist networks globally. That is quite a charter. We were born as a command that mostly organized, trained, and equipped Special Operations Forces for worldwide employment by other operational commanders. But when the President signed the Unified Command Plan a couple of years ago, charging United States Special Operations Command as the lead combatant command for the global war on terror, that challenged us. We had to reorganize; we had to grow; and we had to think quite a

Vice Admiral Eric T. Olson was the Deputy Commander of U.S. Special Operations Command (USSOCOM) at McDill Air Force Base in Florida. USSOCOM ensures the readiness of Special Operations Forces and conducts operations, as directed, worldwide. Admiral Olson is a 1973 graduate of the U.S. Naval Academy. He has served operationally in several conflicts and contingency operations in capacities ranging from underwater demolition teams to the Seal Delivery Vehicle team. He earned a Master of Arts degree at the Naval Postgraduate School and has studied both Arabic and French at the Defense Language Institute.

bit differently to meet the expectations of the Secretary of Defense and the President.

As we began the staffing process for assuming our assignment to plan, coordinate, and synchronize DoD activities on the global war on terror, we realized that we did not know what "synchronize" and "coordinate" meant. One senior government staffer said, "I don't know what coordinate means. If I tell you I want to do something, and you tell me you don't want me to do it, and I tell you I'm going to do it anyway, is that a coordinated action?" We realized that "coordinate" in no way implied any authority to compel behavior. We reattacked with the word "synchronize," which is defined as to arrange actions in time, space, and purpose for maximum effect. That action verb, "arrange," gave us some authority to enforce compliance.

DIRECT AND INDIRECT LINES OF OPERATIONS

On that basis, we have done quite a bit of planning. For example, the Special Operations Command crafted the Department of Defense campaign plan for the global war on terror, which sets forth direct and indirect lines of operations that have to be simultaneously executed. The direct lines of operations are to capture and kill terrorists and dismantle their infrastructures. Another direct line of operation is to prevent the acquisition and use of weapons of mass destruction. Those are largely military operations—kinetic and violent. They are urgent and necessary, but we do not believe for a minute they are decisive.

The decisive lines of operation are the indirect lines of operation, which are to build partner nation and partner agency capacity and deter tacit and active support in other nations that permit sanctuaries to develop for terrorist activity. Further, we must erode the underlying conditions that, to misquote Mao, "Create the sea in which the terrorists swim"—the pervasive poverty, the perceived social injustice, and the persecution and intimidation that can feed the germs of terrorist activity.

The challenge, and part of the irony, is that the Department of Defense is in the lead in the direct lines of approach; but we are definitely not in the lead in the indirect lines of approach. The direct lines of approach are urgent and necessary to prevent violent action against us now, but the indirect lines of approach are the long-term actions that will ultimately be decisive in their impact. We have to count on other agencies of our government and other nations of the world to lead the effort to accomplish the indirect lines of operation.

"Further, we must erode the underlying conditions that, to misquote Mao, "Create the sea in which the terrorists swim"—the pervasive poverty, the perceived social injustice, and the persecution and intimidation that can feed the germs of terrorist activity."

COORDINATION WITH INTERNATIONAL PARTNERS

Another irony is that this government expects the military to fight its way to success. That is clearly not the case—we are not going to fight our way to success; we are not going to kill our way to victory in a global war on terror. The challenges are many: we do need to capture and kill a lot of terrorists, and the Special Operations Command is in the lead on that. Homeland defense underpins all of our efforts to disrupt our active adversaries and their networks, which is an essential activity.

To capture or kill those who are most determined to harm us, we need to identify these adversaries, find them, track them, and analyze them thoroughly enough to be predictive about their behavior. We need a much broader situational awareness to let us know, for example, if a known criminal getting on an airplane in Jakarta is somehow associated with the ship leaving port in Hong Kong. We need to work in concert with other agencies and international partners, and we need to do it with systems that do not withhold information from those who need it. We need to go beyond the formally structured alliances that we are crafting and create a loose association of friends, organizations, and corporations that shares the common goal of contributing to a global environment that is inhospitable to terrorists and terrorist activity.

BARRIERS TO INDIRECT LINES OF APPROACH

For the indirect approach, the decisive approach, the one in which the Department of Defense is not in the lead but only in a supporting role, I fear we are a long way from real success. I think that we do not understand what kind of conflict we are really in. We do not understand the nature of the threat. We do not understand our adversary's behavior because we do not understand the culture, the language, the politics, or the motives. It is going to take us some time to learn what we need to know. We do not yet have the tools to be successful, and this is but one of the reasons that we very much need to count on others.

Exacerbating is a lack of a synchronizing mechanism, even within our own government, for bringing all of these elements together in a cohesive way across agency lines. One of the reasons a forum of this kind is very important is that it brings together representatives from many organizations.

We need a much broader situational awareness to let us know, for example, if a known criminal getting on an airplane in Jakarta is somehow associated with a ship leaving port in Hong Kong.

CONCLUSIONS

In addition, this symposium is partly about technology. I will just take advantage of the opportunity to leave you on a positive note and share with you my two technology dreams. The first is a gun that will kill people for 15 minutes. If you give me a hundred of these, I'll send 99 forward and keep one in my desk drawer. It is a tool that would help enormously in our global war on terrorism. The other technological dream is to banish PowerPoint. In the world in which we are living and fighting, where nuance and subtlety are so important, we are filtering out nuance in our discussions and our decision processes by reducing everything to a PowerPoint slide. I am thrilled to have this opportunity to network and integrate our collective perspectives.

7.2 UNRESTRICTED WARFARE—SENIOR PERSPECTIVES

Albert Calland

INTRODUCTION

Admiral Olson's discussion about the lack of interagency synchronization hit home for me. When I took the job as the Deputy Director for Strategic Operational Planning, the first thing I needed to do was find out what strategic operational planning meant. From a military perspective, it is planning at the strategic and operational levels, which means it is not tactical planning and not execution-level planning. It can be considered a global and regional kind of constructive planning as opposed to short-term tactical planning.

I succeeded Major General Jeff Schloesser, a Special Ops Army aviator, who took command of the 101st Airborne Division. He is the real pioneer. He created the Strategic Operational Planning division at the NCTC [National Counterterrorism Center] with a very small group of people in October 2005. They did not have a single word on paper when they started. Nine months later,

Vice Admiral Bert Calland is currently Deputy Director for Strategic Operational Planning at the National Counterterrorism Center. Admiral Calland is a 1975 graduate of the U.S. Naval Academy. He's commanded at all levels, including now retired Seal Team One from 1992 to 1995 and the Naval Special Warfare Development Group from 1997 to 1999. Admiral Calland assumed command of Special Operations Command Central in July 2000 and transitioned his warfighting functions forward after 9/11, directing more than 3000 coalition Special Ops forces in Operation Enduring Freedom in Afghanistan. In 2004, he became Associate Director of Central Intelligence for Military Support. From 2005 to 2006, he was Deputy Director of the Central Intelligence Agency.

Jeff and 200 different interagency representatives had produced a document called the “National Implementation Plan for the War on Terrorism,” approved by the President, and supported by all the departments and agencies. The plan called for 515 tasks, each of which would be assigned a Cabinet-level lead and various partners associated with that particular task. Everything had to be vetted through the deputies and principal committees, and it all got approved in 9 months. It is remarkable, in my experience, to accomplish a task that broad and that potentially controversial in such a short time.

Twenty or so different agencies have lead tasks according to the plan. More important, from my viewpoint, is that 35 different committees in Congress are involved. It is classified at the Secret level, and it is considered by some to be our war plan for the war on terrorism. When I took over Jeff's position in September, my job was to do planning, implementation, and assessment. Now, I have to bring the interagency community together to actually accomplish the tasks that have been assigned to them. The harder part is determining if they are actually doing the job, and I have been spending my days and nights trying to figure out how to do that kind of evaluation. We have had several meetings that have served to bring the interagency community together to talk about issues of mutual concern. Everyone was told, “If you've got a task, you're responsible for accomplishing it.”

WHAT THE PLAN IS AND WHAT IT IS NOT

The National Implementation Plan has four key elements: protect the homeland, pursue the enemy, win the war of ideas, and prevent terrorists from acquiring WMD. The four elements are supported by 25 strategic objectives, 89 subobjectives, and 515 tasks. The document is a compilation of what we are doing in the war on terrorism, down to some very specific details. Some of the tasks are very specific; others are very broad. It is not a strategy; and it is not a plan. It is not sequenced over time. It does not say where we are now, where we are going, or how we are going to get there. Right now, we are reviewing it on an annual cycle. My intent is to implement an almost continuous review because the plan needs to be a living document that changes with time as required.

PARTNERS IN THE WAR ON IDEAS

We need to be able to write the long-term strategy for the war on terrorism and describe what it is, where we are, where we are going, or the end state. How do we win this war? What does victory look like? What does it mean? And how do we get there on this path? The key element is our relations with our partners. We are not going to be able to succeed on our own. First, we do not have the credibility with the Muslim world to win hearts and minds—to prevent the 5-year-olds from becoming the 15-year-olds that strap on a suicide vest and blow themselves up. We have to link up with partners overseas who can provide the message that is going to make the difference.

There are other partners out there who are following our lead in building their own kind of national implementation plans. To fight the enemy, we have to be able to coordinate, integrate, and synchronize our activity, not only within the U.S. government but also globally. We're starting to work with the British to coordinate our activity. They don't want to call it a war on terrorism because of the connotation of a World War II-type conflict. Actually, we are predominantly in a state of peace with flare-ups of violent activity. The British are thinking about it more in terms of a fight rather than the war. We ought to do that as well. As we look at the long-term strategy that we need to be successful at the end state, what is it that we need to measure? What metrics do we need to tell whether or not we are heading in the right direction? I content that one of the most important measures is the image of this country overseas, whether our image is moving in a positive direction or in a negative direction.

As we pursue the war of ideas, our focus needs to be on the message. If we have to take aggressive action against a terrorist organization that may result in damage to our image, we need to know that beforehand; we need to craft the message to mitigate it; and we need to be able to restore that image faster. The bad guys are better at this than we are. They are able to manipulate;

they are not constrained by the truth; and they are able to get their message out faster than we can get our message out. We're losing the war of ideas right now, and that is the fight that we are after. That is really what we need to focus our attention on. Our relationships with our foreign counterparts are absolutely vital. That is really the difference between winning and losing this fight in the long run.

"First, we do not have the credibility with the Muslim world to win hearts and minds—to prevent the 5-year-olds from becoming the 15-year-olds that strap on a suicide vest and blow themselves up. We have to link up with partners overseas who can provide the message that is going to make the difference."

I once believed that fighting terrorism was all about speed and personal relationships. I still believe that to be true. Personal relationships enable the speed. If you know somebody personally and you can pick up the phone and make a phone call, you can make things happen. Agencies and organizations will never trust one another. It is critically important and vital that we develop those personal relationships. We can move only so fast. The CIA is probably the fastest reacting organization in the U.S. government, but even it cannot react quickly enough because of the speed of information. Because we cannot react fast enough to make decisions and move globally, we have got to be predictive. We have got to get out of the purely reactive mode and take risks. We have to decide where we are going to be before a situation arises and put the pieces in place before it starts to go downhill. It is a different philosophy. We need to think differently. How do we do that, and how much risk are we willing to take to move that far forward?

7.3 UNRESTRICTED WARFARE—SENIOR PERSPECTIVES

Nancy Brown

We are fighting a war in cyberspace today. We are completely dependent on and vulnerable in cyberspace. The Internet touches just about everything in our lives today—banking, utilities, and transportation. Even a small disruption in those connections could be catastrophic for us, our economy, and our way of life. Yet, we lack resiliency in the Internet and cyberspace.

We're fighting today in a much different environment than in the past. The battlefield today is in cyberspace to a large degree. We have not adapted to fighting in cyberspace very well. We have lots of laws, policies, and cultural precepts that hinder us from attacking the adversary in that arena. We need to change the way we are thinking about how to fight, the capabilities that we are developing to fight, and the way we approach our adversary.

There are several aspects of the network we should be concerned about, particularly the physical connections of that network. The Chinese launched a successful Anti-Satellite

Vice Admiral Nancy E. Brown, Director for C4 Systems, is the principal advisor to the Chairman, Joint Chiefs of Staff on all C4 systems matters within the Department of Defense. Her distinguished career spans 32 years and includes directing the C4 Systems of the North American Aerospace Defense Command and Architectures and Integration of the U.S. Northern Command. She has served on the National Security Council staff at the White House and the Deputy Director, White House Military Office. In August 2004, she deployed to Iraq, becoming the first Multi-National Force–Iraq C6 Headquartered in Baghdad. VADM Brown has earned a Master of Science degree in Communications Systems Management and a Master of Arts degree in National Security and Strategic Studies from the Naval War College.

Weapon (ASAT) recently and actually destroyed one of their own satellites in space to prove their capability. We need to address the vulnerabilities in our space segment and learn how to better protect it as our enemies become more sophisticated in this area.

We have not been able to compete with our enemies in the way they use the Internet. They are very effective at distance learning. They provide training on how to make IEDs or a suicide vest; they recruit; and they spread their ideology. And they do it anonymously, which fits with their objective of not having to identify themselves. We need to be more effective in countering their use of the Internet; but so far, their ability to exploit it has outpaced our ability to develop countermeasures.

How can we use the Internet more effectively to spread our philosophy and counter the enemy's? What are we doing to improve our ability to counter the enemy's use of the Internet, to improve the resilience of our network, to fight and operate in cyberspace, and to protect our national interests? We have developed a national military strategy for cyberspace operations. We are currently working on an implementation plan so that we can start exercising and improvising our capabilities. The combatant commanders, including SOCOM, have taken several initiatives to move this effort forward as fast and as far as they can under current constraints of interagency requirements, the legal system, and cultural imperatives.

We have to embrace this new warfighting domain and learn how to maneuver in it as effectively as our adversaries do.

7.4 UNRESTRICTED WARFARE—SENIOR PERSPECTIVES

Thomas Mahnken

INTRODUCTION

What is the DoD posture on irregular threats at the levels of strategy, analysis, and technology? The Quadrennial Defense Review provides good strategic guidance, with an emphasis on indirect approaches to irregular threats and building partnership capability. The main challenge facing the Defense Department now is how to translate that strategy into action.

One issue has been the difficulty in reading an agreed-upon definition of irregular warfare across agencies. Although the 2006 Quadrennial Defense Review identified irregular warfare as a key area for the Defense Department, the Department did not adopt an official definition of irregular warfare until April 2007. Further, we lack a common definition that is applicable across the U.S. government. For example, what the Defense Department terms "irregular warfare," the State Department terms "counterterrorism." And our friends and allies have different definitions yet. We are often talking about the same things but using different terminology; it confuses rather than clarifies.

Dr. Thomas Mahnken, Deputy Assistant Secretary of Defense for Policy Planning, provides advice on strategy to the Deputy Secretary of Defense and the Under Secretary for Policy. He's also responsible for the preparation of guidance for war plans and the development of defense planning scenarios. Previously, Dr. Mahnken was Professor of Strategy at the Naval War College and a visiting fellow at The Johns Hopkins School of Advanced International Studies, where he taught a variety of courses on strategic matters. He also served on the staff of the Robb-Silberman Commission. As a Navy Reserve intelligence officer, he served the Naval Special Warfare units in Iraq and Bahrain; and he was part of NATO's initial deployment in Kosovo.

STRATEGY

The central conundrum facing the U.S. military and the Defense Department is whether to plan for the ideal when it comes to irregular warfare or to plan for what has been our experience to date. We understand that military responses are a small fraction of what is needed to deal with irregular challenges, and direct military actions are an even smaller fraction yet. However, recent experience has shown that national leadership and international groups look to the Defense Department to provide the solution to these problems. We realize that the Defense Department does not hold the solution, but we also do not have the power to bring all of the tools of national power and all of our allies to bear on reaching the solution. Do we count on our friends, our allies, and other parts of the U.S. government playing the roles that they should? Do we plan for the Defense Department to play those roles even though it is not well equipped to do so and probably should not be doing so?

ANALYSIS

We are not as far along in analysis as in strategy. We are only in the early phases of translating irregular warfare concepts into the type of analysis needed to inform senior decision-makers. Irregular warfare, indirect approaches, and working with and through partners, both in the U.S. government and overseas, are not the classic focus of defense analysis. We have a very rich, capable, robust defense analysis community; but it was built largely to answer questions and challenges that we faced in the past. We need new tools to help decision-makers make the difficult decisions needed to address today's challenges. Developing these new tools requires understand our partners in the U.S. government, their capabilities and understanding of our foreign partners, and the very rich societies and cultures in which they operate.

We are in the process of developing a new generation of defense planning scenarios that deals with irregular warfare that operationalize the indirect approach. It is critical that we characterize not just our adversaries but also our partners, our friends, and our allies. We need to know how much we can rely on them, what their objectives are, and so forth. The government and the analytic community are not well configured currently to answer those questions. A cultural, societal approach to some of these challenges is not confined only to irregular warfare but speaks to the full range of challenges that we face. The challenge posed by Kim Jong-Il's regime cannot be fully appreciated without an understanding of the culture of North Korea and its social networks as well as its military might. The same is certainly true of Iran: understanding the Iranian government and Iranian decision-making at a national level requires understating it at a cultural level and social level as well. We have a lot of work ahead of us.

7.5 UNRESTRICTED WARFARE—SENIOR PERSPECTIVES

Philip Mudd

INTRODUCTION

I remember flying in an aircraft as part of a small diplomatic team into Afghanistan in November of 2001. If you had drawn a picture of the situation on the ground, I think you would have said that it was pretty good. Karzai was still there. There was major progress against the al Qaeda infrastructure. There was a global coalition of security services fighting this war with no overarching security agreement to do so. And we had no attack in this country.

In those days, especially after we faced the anthrax letters, you, like me, were saying, "Where are we going?" Karzai is still around after a rapid diplomatic process that no one would have foreseen, a process many of us would say was unconventional and unrestricted. We had covert action that started with the support of the Northern Alliance just weeks after the attacks, combined with the gallantry of the Special Forces people who worked with Admiral Calland, which paved the way for big green, the U.S. Army. After the Soviet quagmire, we never would have anticipated that progress. It was unrestricted because of speed,

Mr. Philip Mudd has been Associate Executive Assistant Director of the National Security Branch at the FBI since August 2005. The National Security Branch focuses principally on terrorism. Prior to his being at the FBI, Mr. Mudd served as the Deputy Director of the CIA's Counterterrorism Center, overseeing operational, analytic, and support programs. Mr. Mudd joined the CIA in 1985 and worked in a variety of positions focused on South Asia, the Middle East, and terrorism. From 2001 to 2002, he served at the White House on the National Security Council as the Director of Gulf, Near East, and North African Affairs.

because we had covert operatives directing air strikes and UAV (unmanned aerial vehicle) attacks, and because Congress was giving us as much money as we ever asked for—dumping money on the Northern commanders. It was a remarkable combination of speed, of partnerships in the field, and of building on covert action, capped by a diplomatic web around the country. It was never formalized. In some ways, it was unconventional; in some ways, unrestricted.

I do not think that is the whole story. We had identifiable defined targets: Taliban and al Qaeda. We had a defined space: Afghanistan. We had defined tools: covert action, Special Forces, the U.S. military, security services, and allies that we knew how to work with. I would argue that it was different but not unconventional.

THE WAR OF IDEAS

Let me fast forward to the children who want to do what they see done overseas, who watch suicide bombers and want to be one themselves. I joined the Bureau in September. Within the space of 3 days, I heard, I participated in, and still participate in the daily operational briefs for the Director on the major cells and cases in this country. In the initial briefs, we had a tip about a 17-year-old who was researching on a library computer how to build an improvised explosive device.

The success of the al Qaeda organization, the adversary we face, is not because of weapons. It is not because of the murder of 3000 innocent people. It is because people who have never met, touched, or received money or training from al Qaeda have a way of thinking that says the killing of innocents is acceptable. The most dangerous thing we face is ideas.

The picture I drew of an al Qaeda organization that is decimated is a positive picture. As warfighters, we say we are succeeding. I see this world in negative terms because, from al Qaeda's viewpoint, it has won when a 17-year-old in the southeastern United States thinks as it does, researches as it does, and is about ready to act solely because he self-radicalized on a computer. How do we think about this in unconventional terms, in unrestricted terms? We do not, we will not, and we probably should not fight unrestricted warfare in this country.

Here is the world I see, as someone who worked as an analyst but also oversaw covert operations at the CIA when we really had, in some senses, unrestricted warfare. What do we do about a child who is not communicating with a known cell, who lives in a U.S. city, and who is self-radicalizing on a computer? The Internet is great, but it is my enemy. What do I do about free speech issues? I cannot block Internet websites where he self-radicalizes—that is a free speech issue.

"It is because people who have never met, touched, or received money or training from al Qaeda, have a way of thinking that says the killing of innocents is acceptable. The most dangerous thing we face is ideas."

HOW DO WE FIGHT THE WAR OF IDEAS?

I will discuss the kinds of measures we can and cannot take. I am not arguing for or against them. I am saying that, if you think about wars in unrestricted terms, these are the kinds of things you think about. Can I go into a mosque and suppress hate speech? No. You are free to talk about the jihad in this country. Can I recruit informants freely and tell them what to do and what information to collect? No.

What we have is an architecture of youth that is not organized in ways that we have seen in the past. They do not touch a known person; they do not touch a known cell. We cannot use known security tools. We cannot follow their phone calls because they are not calling anybody. We cannot follow who they are talking to on a computer because they are self-radicalizing on their own computer, and they are not chatting. We cannot follow them in terms of a vehicle or somebody they are meeting on the street because they are not a member of a cell. How do we stop them? I cannot stop them by suppressing free speech; I cannot stop them by unrestricted collection of intelligence in this country; I cannot stop them by blocking websites.

I have presented the kinds of tools we think about using now and we have thought about using in the past. I think we could look at Afghanistan as a case, in some ways, of unrestricted, of new warfare. Those tools are designed for use against knowns: known space, known time, a known enemy, or known tools. The tools that we need now fight not weapons and not WMD but the idea that killing innocents is okay. I cannot stop that 17-year-old any other way than trying to figure out how to stop that idea from getting into his head from a computer. Fifteen years ago, you needed a trainee coming from an Afghan camp to radicalize somebody in Afghanistan. Today, you can watch the beheading of an American citizen in Iraq on your computer in Sacramento.

"How do we stop them? I cannot stop them by suppressing free speech; I cannot stop them by unrestricted collection of intelligence in this country; I cannot stop them by blocking websites."

COMMUNITY INVOLVEMENT

The Internet is killing us. The world has changed fundamentally in 15 years. What we need to fight this war—to go way out of the box—are people in communities who talk to their children about the damage done by ideology. We need foreign services overseas putting clerics on TV who say it is wrong. We need people in this country telling us if somebody is wearing camouflage into services and talking about Iraq. We need to think about how ideas spread, who has their fingers on the pulse of a community, and how to look for people who are self-radicalizing by using tools we never knew about before.

CONCLUSION

In the nuclear age when the enemy was the Soviet Union, we had the luxury of imagery to look at sites, SIGINT (signal intelligence) to look at communications, HUMINT (human intelligence) to recruit sources and defectors, and international organizations like the IAEA (International Atomic Energy Agency) to watch material. Try to apply a single one of those to a 17-year-old in the United States today.

7.6 QUESTIONS AND ANSWERS HIGHLIGHTS

Transcripts

Q: *From a terrorist's perspective, what can we hold at risk?*

Mr. John McLaughlin – By hold at risk, are you talking about deterrence?

Q: *What can you hold at risk so that we have a chance at influencing the terrorist's actions?*

Mr. Philip Mudd – We talk about how much we fail in the war of ideas, and I agree. Analysts are pessimists by training. You would be surprised by how much the adversaries talk about what we say. We think we fail, and we do. I think they are better: they're faster; they don't have to stick to facts. But they worry a surprising amount about what we say. If we have spokespeople who they think are respected by their target audience, they're going to be frustrated because they know that the measure of success is not a bomb; it's an idea. Why does Zawahiri talk about Palestine? Why does he talk about Darfur? Because he wants to be seen as a statesman who infects people with the way he thinks. In his world, according to surveys, he is seen as an international statesman, not a terrorist. If we work with foreign partners to get spokespeople who are respected by youth, the adversary will notice.

Dr. Thomas Mahnken – I would say exactly what Phil says. The phenomenon is that a Zawahiri tape, filmed in Pakistan, for example, and a talk by the President of the United States have virtually the same audience. It's remarkable that someone like Zawahiri can have that kind of breadth of influence. At the end of the day, it's a war of ideas; it's the message of the Koran; it's their Islamic beliefs. Those are ideas that we have to debate with them on a much larger scale because they legitimize violent jihad.

That's the only real point we have because they base everything they do on their faith and their religion.

Mr. John McLaughlin – It's true that the jihadist message has a large audience. If we harken back to the Cold War, it was not very long ago that Marxism and Leninism had a huge international following. The Communist Manifesto was widely printed, widely read, and widely studied. That's not true anymore. Communism exists in one form or another in Cuba; North Korea; Cambridge, Massachusetts; Santa Monica, California; and a couple of other places; and we can laugh about it. We didn't used to laugh about it. What we're talking about here in terms of ideology is a particularly virulent strain of radical jihadist Islam. Success in this war will be a bunch of people in a room sometime in the future laughing at jihadism the way you just laughed at my little joke about Communism.

Q: *How do we accomplish that? There's a lot of room for improvement for strategic communications. We're not particularly good at it as a government. If you listen to the jihadists, we think we're dong a bad job. They think they're doing a bad job. From their perspective, they see that we control the world's media; we have all the outlets, including a lot of the outlets we consider to be jihadist outlets. They don't necessarily see themselves as doing particularly well. Certainly, to the extent that we and others portray what they are really doing—the killing of innocents and all sorts of similar actions—that type of a vision is delegitimized and depopularized. Eventually, if we are successful, there will still be jihadists around; but we'll be able to laugh at them. We won't be afraid of them.*

Mr. John McLaughlin – Any other thoughts on that question? Could Vice Admiral Olson discuss DoD plans for expanding and upgrading psychological operations and civil affairs operations? What are the objectives? How are the objectives to be achieved?

VADM Eric Olson – Psychological operations is a widely misunderstood discipline. Many people suspect that it has to do with untruths and brainwashing, when, in fact, it's really the opposite. I would define psychological operations as simply truthtelling for a purpose. Psychological operations messages, by definition, are truthful and accurate but are meant to influence.

Active duty psychological operations forces in the Department of Defense are members of the United States Special Operations Command. Until recently, the reserve component, which was the larger component, also belonged to the Special Operations Command; but they were transferred to the big Army because of the way they were allocated to conventional force commanders.

There is a plan to grow psychological operations on both the active and the reserve sides—they're going to almost double on the active side and grow somewhat on the reserve side. They are people who are oriented linguistically and trained and attuned culturally. They craft a truthful message to influence the behavior of foreign audiences. That is a skill set that is very much in demand now. There is no intent, no plan, to use them differently than they have been used in the past except in one subtle way: under the umbrella of what's referred to generally as strategic communications, which incorporate public affairs activities, support for diplomacy activities, and psychological operations activities. Psychological operations will craft their themes by a new method, have their themes approved, and have oversight at the OSD level over PSYOP activities.

On the civil affairs side, we often use civil affairs and PSYOPS, which are very different activities done by different people with different skill sets but for a similar purpose—to influence behavior in some way, largely by gaining access to and gaining the trust of the people in the environments in which we work. Civil affairs activities include digging wells, painting school houses, reconstructing water purification plants, and repairing oil transfer facilities—all projects that contribute to local welfare. Civil affairs in the United States military generally do not perform the activity; they plan the activity and then contract, or otherwise employ, local labor to conduct the activity. Everybody wins. These are activities that are very important in the indirect approach to the global war on terror.

With respect to the previous question, what we can hold at risk is the neutral or moderate Muslim population. That is who everybody is trying to win over now. We will win them over, not with messages but with behavior that gains respect. The issue is less about ideology than it is about theology and genealogy. This is about faith and beliefs and bloodlines and tribes. No matter how compelling our message, as long as we only say it, it's not going to be compelling enough. Strategic communications are really 80% about what you do and 20% about what you say about it. Our psychological operations activities and our civil affairs activities are in the what-you-do part of that spectrum, not in the what-you-say-about-it part. The psychological operations planners contribute to military operations for their psychological effect, not just their military effect. The short answer to what are we going to do with civil affairs and psychological operations is we're going to do them, and we're going to do more of them. But the doctrine for psychological operation or civil affairs operations really hasn't changed; just the demand hs changed. We're working to realize that.

Q: *The question about how do you influence a 17-year-old, whether in the United States or in Iraq, is like perfecting the art of selling icemakers to Eskimos. If we were talking about how do we get 17-year-olds to buy a pair of jeans, or to bring his friends alcohol, etc., or which gang to be involved in, we know the answer to those questions. There was a time when this country took things more seriously and when we mobilized all of our assets. Hollywood produced movies that showed people who the bad guys were, and our popular culture stars were involved. I can't help but believe that's the reason we're losing here. Is somebody working on this? I know that Admiral Olson can't go to Hollywood and contract for a movie about an Iraqi police officer that depicts suicide bombers as bad guys. But somebody should be able to do that. Somebody should be in the movie business.*

Mr. John McLaughlin – Is your question: Are there serious impediments, or what are the impediments, to that kind of approach?

Q: *Exactly.*

Dr. Thomas Mahnken – I chose my words carefully earlier when I said we, as a government, are not very good at strategic communications. We, as a country, as a society, have a pervasive impact on this world. That's part of what the jihadists don't like.

Part of the answer is to keep doing what we're doing. "American Idol" is a show that's been franchised over great parts of the world, including places like Indonesia and Lebanon; and it drives the jihadists wild. Why? Because it's entertainment. In their view, it's morally corrupting entertainment. As far as I know, nobody in the U.S. government is paying off "American Idol" to get it franchised all over the world. A lot of the cultural impact is due to what we, as a government, do. A lot of it is also what we do naturally as a society. There are actually a lot of positive trends there, not because of deliberate planned government action but because our society exports culture. Some of it is bad, but a lot of it is just inherently attractive to large parts of the world.

Q: Nearly every speaker has made the case that there is no good way to synchronize efforts across agencies to bring the whole of government response to the complicated problems we've discussed. If this is such an issue, who has the lead in addressing it? Or does anyone?

VADM Bert Calland – The National Implementation Plan addresses the war on terrorism piece. I'm not going to take any responsibility for the rest of what goes on in government; but for the war on terrorism, the responsibility to coordinate, integrate, and synchronize activity, as described in the National Implementation Plan, rests with the National Counterterrorism Center (NCTC). For example, there are over 30 tasks in the National Implementation Plan assigned to biometrics; five different lead agencies at the Cabinet level are responsible for one or more of those tasks. It's a recipe for everyone going off in different directions and buying different types of technology that are not compatible with somebody else's technology. DoD has a big biometrics program; the FBI obviously has a huge biometrics program; CIA has biometrics. Homeland Defense has a huge interest, obviously, with borders; and passports and also the State Department. Once we decided to coordinate biometrics, the first task of my organization was to find out what was being done in this area in the U.S. government. We found seven or eight different significant working groups. The job of the NCTC is to be the facilitator for bringing them together and getting them to communicate, integrate, synchronize, and coordinate for greater efficiency. This is the first major piece of one of our Coordination, Integration and Synchronization (CIS) areas developed from the National Implementation Plan. We were directed to do it by the Deputy's committee, and it's working very well. The difference is that the NCTC doesn't have any real authority to tell any one of the other Cabinet-level agencies to do anything other than facilitate and ensure the meeting. Our responsibility is to deconflict and coordinate that activity. We're doing that in several other areas as well. That's all part of the National Implementation Plan strategies.

Q: *Could Vice Admiral Brown comment on the national military strategy to conduct cyberspace operations, which was signed in December 2006? What is the DoD policy for active defense? When can it be conducted? What are the limitations? Who authorizes active defense options?*

VADM Nancy Brown – The strategy doesn't actually address or answer those questions. The strategy lays out broad objectives and the overall strategy for cyberspace operations. The implementation plan calls for looking at organizations, roles, and responsibilities—who does what, how we organize for success in cyberspace, how we train, and the service responsibilities for training and equipping. So, those questions will be answered in the next several months as we work through the implementation plan and we equip ourselves to work in the cyberspace environment. Unfortunately, we haven't answered those questions yet; but we are working on them so we can move ahead in this environment.

Q: *This question is a followup for Vice Admiral Brown and also for Mr. Mudd. How would you go about balancing the desire to deny an adversary use of the Internet and, conversely, the need to have a medium such as the Internet to become aware of and knowledgeable about emerging adversaries, their intents, and the capabilities?*

VADM Nancy Brown – I wouldn't say that we would deny them use of the Internet. We need to counter their use of the Internet by using it ourselves. We also can compete more actively with them on the Internet by spreading our message and by helping to present our viewpoint so that people accessing the terrorists' websites will also have the opportunity to see the other side. I'm not suggesting that we completely deny them use of the Internet; rather, we should compete with them for the people that use the Internet to get their information and learning. If they see only one side of the story, that's all they learn.

Mr. Philip Mudd – I wholeheartedly agree, both from a policy perspective and a technical perspective. We will never stop the flow of ideas, and we'll never be able to put our finger in the dike of technology flow. Furthermore, we live in a country where we say people have the right to say whatever they want and hear whatever they want. I agree with Admiral Calland: whether it's the KKK or jihadists or somebody who's research a paper for his university on jihad, they can read whatever they want. The problem here is when people start to say: "forget about diplomacy; forget about the Arab-Israeli dispute; forget about Iraq." If you choose to strap on a weapon and kill a woman and a child, I don't care where you are, that's not right. The tools we use—military, diplomatic, intelligence, law enforcement, and partnerships with security services—are designed to stop people after they've already made a decision. We need a way of getting people to believe that this is a stupid way to think. It's not only futile, but it's unreasonable to stop people from reading on the Internet or to stop the flow of technology that allows them to read whatever they want.

VADM Bert Calland – One of the six NCTC CIS areas is terrorist communications. It was organized to address terrorist use of the Internet. All those that have equities, capability, and capacity come together in a forum to deal with some of these issues. If we want to try to disrupt or deny or anything else associated with the Internet, there may or may not be ways to do that. The larger decision is whether or not we take any type of disruption action. Disruptive action consists of two parts: the disruption itself and the ability to exploit it. There's always a balance between whether you want to find out information or you want to stop it. But if you decide you want to shut it down or somehow disrupt a particular website or terrorist communications capability over the Internet, they can easily reroute it and be back up minutes later. You're just diverting it. Our group meets and discusses those very issues.

Q: *It took Communism 70 years to collapse. Does anyone on the panel think that this jihadist program will last 70 years; will it last a lot longer, or will it be shorter?*

VADM Eric Olson – I believe this is a fight of a generation. In the U.S. government, we typically have very short-term perspectives. That outlook is understandable when you consider that the principal customer of our country, the President, needs to stay current on the issues. That means that the entire chain of command has to stay current on those issues because they have to be able to brief their bosses, who have to be able to brief their bosses, who have to be able to brief the President. Who's looking over the horizon? Who is taking the long-term view? The COO of Microsoft Corporation is thinking 10 years from now. That's his job, to figure out what the system after the next system is. Our problem is that we don't have many people doing that kind of long-term planning in government. It used to be that we didn't know what was going on in some town in China. Now we do. It's out there in the ether and it's getting pushed. So there's no excuse.

VADM Bert Calland – You have to separate the planners from the people working on current projects and tell them, "Your job is to look over the horizon, not at the current work." That's one of the challenges. My job is to take a strategic view. There is a huge amount of pressure on me to get pulled into current work. I have to push back on it.

VADM Nancy Brown – When you're talking about hearts and minds, you're talking about something that doesn't happen overnight. A good example is the tsunami and the impression that the residents had prior to U.S. help and afterwards. We have to be persistent. If we don't return and if we don't continue that contact, that goodwill won't last. We have to continue to build on it; and we can't do that with just military folks being around with armor and weapons. We have to get beyond that and start addressing basic needs, like health and education, to win hearts and minds. That's a long, long process.

Dr. Thomas Mahnken – It's likely we're talking about multiple decades. Certainly, there are things that could further protract the conflict to the extent that the jihadists might appear—incongruous as it may sound—as the wave of the future if they're seen as successful. That will gain them support. That will prolong their popularity. Conversely, there are historical examples of violent extremist groups that have imploded fairly quickly. In the 1990s, Algeria was gripped by a jihadist insurgency; it imploded with a little bit of help. I think we are definitely talking multiple decades.

Afterthoughts

AFTERTHOUGHTS

John McLaughlin

As I have listened to all the speakers here, I cannot help thinking that it is as though someone pressed the reset button; and we are back in 1947. I do not mean in terms of facing a Soviet-like threat but in terms of the difficulty at that moment of transition of coming to grips with the new world order. Today, it is complicated to the tenth power compared with the situation in 1947. We search for a strategic concept that is as simple as the one they had; we have yet to find it. We have enormously skilled and dedicated people throughout the U.S. government, and yet speaker after speaker has lamented the difficulty of orchestrating all of this talent to achieve the maximum punch.

In a sense, we know everything and nothing. In other words, there are more data available, there is more noise, and there is more of everything. Yet, we thirst for the secrets we do not have, which are increasingly in the hands of the smaller and smaller groups of people, who husband them with greater and greater success.

We are at one of those moments when, as in the 1950s and 1960s, faced with what we did not know, we had to devise innovative collection techniques. The history of the Corona

John McLaughlin is a Senior Fellow in the Merrill Center for Strategic Studies at the Paul H. Nitze School of Advanced International Studies (SAIS) of The Johns Hopkins University. He has served as Acting Director and Deputy Director of the CIA, Vice Chairman for Estimates, and Acting Chairman of the National Intelligence Council. He is a member of the Council on Foreign Relations, a nonresident Senior Fellow at the Brookings Institution, and a national security advisor to the Cable News Network (CNN).

program is very instructive in this respect. It was a remarkable achievement, a Rube Goldberg-like struggle that ultimately allowed us to get the knowledge we needed. Here, we are today, locked into traditional collection methods - imagery, SIGINT, HUMINT—but we still do not know enough. We need people in places like JHU/APL to tell us how to see through dirt; tell us how to exploit the potential of hyperspectral phenomena; tell us how to reach beyond what our traditional collection techniques have allowed us to know more than we do. The participants in this symposium have delivered remarkable insights from the front lines, and we thank them.

Appendix A

Symposium Agenda

APPENDIX A

MEETING THE UNRESTRICTED WARFARE THREAT: INTEGRATING STRATEGY, ANALYSIS, AND TECHNOLOGY AGENDA

DAY 1
(20 March 2007)

8:00 – 8:15 Welcome and Insights from 2006
Dr. Ronald Luman, JHU/APL

8:15 – 9:15 Keynote Address: Warfighter Perspective on Integration of Strategy, Analysis, and Technology
General James Cartwright, Commander, USSTRATCOM

9:30 – 11:30 Strategic Policy Roundtable I: The Nature of URW
Prof. Thomas Keaney, JHU/SAIS (Moderator)
Prof. Mary Habeck, JHU/SAIS
Dr. Brad Roberts, IDA
Dr. Michael O'Hanlon, Brookings Institution

11:30 – 1:15 Luncheon Speaker
Prof. Bruce Hoffman, Georgetown University, author of Inside Terrorism

1:30 – 2:15 Analysis Policy Message: Adapting to URW
Clarify distinctions between analyses needed to support intelligence, operations, and capabilities, and address the analytic agenda needed to support combating URW.
Mr. Michael Bauman, Director, TRADOC Analysis Center

2:15 – 3:15 Technology Policy Message: Adapting to URW
How should we adapt our advanced technology development and deployment processes to defeat adversaries engaged in URW strategy and tactics?
Dr. Anthony Tether, Director, DARPA

3:30 – 5:00 Analysis Roundtable: Analytic Successes and Applicability to URW
Concrete examples of analyses that have worked well in the past, and extrapolate applicability to analysis of URW as they pertain to intelligence, operations, and capability.
Dr. L. Dean Simmons, JHU/APL (Moderator)
Mr. Timothy Bright, ODPA&E
Dr. Andy Ilachinski, CNA
Prof. Gary Shiffman, Georgetown University

6:00 – 8:00 Dinner Speaker: Private Sector Viewpoint
Prospective view on threats from various non-kinetic aspects of unrestricted warfare, such as financial, resource, smuggling, and network warfare.
Mr. Alfred Berkeley, Chairman/CEO of Pipeline Trading Systems, former Vice Chairman of the NASDAQ Stock Market, Inc.

DAY 2

21 March 2007

8:00 – 9:45 Technology Roundtable I: URW in the Information Domain

Technologies and high-level threats will be described in the context of IT globalization, and key aspects of critical information infrastructure protection will be discussed.

Mr. Timothy Galpin, JHU/APL (Moderator)
Mr. James Gosler, Sandia National Laboratories
Mr. Daniel Wolf, Cyber Pack Ventures, Inc.
Col. Steven McPherson, US Air Force, Cyberspace Task Force

10:00 – 11:45 Technology Roundtable II: URW in the Physical Domain

Technologists will review recent successes and challenges to provide insights on identifying and fielding technologies that provide capability for dissuasion, attack, and defense against URW threats.

Dr. Jose Latimer, JHU/APL (Moderator)
Mr. Jeffrey David, TSWG
Mr. Bennett Hart, JIEDDO
Dr. Brian Pierce, DARPA
Mr. Tim Healy, FBI

12:45 – 1:30 Keynote Address: Intelligence Community Perspective on the Maturing URW Threat

Dr. Mathew J. Burrows, Director, Analysis & Production, National Intelligence Council

1:45 – 3:15 Strategic Policy Roundtable II: Tailored Deterrence: What Will It Look Like?

What are meaningful objectives and approaches to tailoring deterrence postures for various state and non-state actors utilizing unrestricted warfare grand strategies?

Mr. Thomas McNamara, Jr., JHU/APL (Moderator)
Col. Charles Lutes, USAF
Dr. Jasen J. Castillo OUSD(P)
Mr. William V. Parker, USSTRATCOM

3:30 – 5:00 URW: Senior Perspectives

Senior government leaders will give a short message on their perspectives and then field questions from the audience.

Mr. John McLaughlin, Senior Fellow, JHU/SAIS (Moderator)
VADM Eric Olson, Deputy Commander, USSOCOM
VADM Albert Calland, Deputy for Strategic Planning, National Counterterrorism Center
VADM Nancy Brown, Joint Staff (J6)
Dr. Thomas Mahnken, Deputy Assistant Secretary of Defense for Policy Planning
Mr. Philip Mudd, Associate Executive Assistant Director of the National Security Branch, FBI

Appendix B

Acronyms and Abbreviations

APPENDIX B

ACRONYMS AND ABBREVIATIONS

ASAT	Anti-Satellite Weapon
ASCE	Association for the Study of the Cuban Economy
ASIC	Application-Specific Integrated Circuit
ASW	Antisubmarine Warfare
C^2	Command and Control
CA	Certificate Authority
CAA	Center for Army Analysis
CAS	Complex Adaptive Systems
CBRN	Chemical, Biological, Radiological, and Nuclear
CBW	Chemical and Biological Weapons
CDC	Centers for Disease Control
CDMA	Code Division Multiple Access
CF	Coalition Forces
CIS	Coordination, Integration and Synchronization
CITO	Clandestine Information Technology Office
CLASS	Consular Lookout and Support System
CNA	Center for Naval Analyses
CND	Computer Network Defense
CTTSO	Combating Terrorism Technology Support Office
CVSS	Common Vulnerability Scoring System
CYBERCOM	Cyberspace Command
DARPA	Defense Advanced Research Projects Agency
DEW	Distant Early Warning
DHS	Department of Homeland Security
DI	Directorate of Intelligence
DIA	Defense Intelligence Agency
DLI	Defense Language Institute
DNI	Director of Naval Intelligence
DoD	Department of Defense
DPG	Defense Planning Guidance
DSB	Defense Science Board
DTRA	Defense Threat Reduction Agency
EINSTein	Enhanced ISAAC Neural Simulation Tool

FEMA	Federal Emergency Management Agency
FOIA	Freedom of Information Act
FOM	Figure of Merit
FORESTER	Foliage Penetration Reconnaissance, Surveillance, Tracking, and Engagement Radar
FRAGO	Fragmentary Order
FSC-C	Future Combat Systems–Communications
FSO	Free Space Optics
GA	Genetic Algorithm
GIG	Global Information Grid
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GUI	Graphical User Interface
GWOT	Global War on Terror
HHS	Health and Human Services
HITRAC	Homeland Infrastructure Threat and Risk Analysis Center
HPCS	High Productivity Computer Systems
HUMINT	Human Intelligence
IA	Information Assurance
IAEA	International Atomic Energy Agency
IDA	International Development Association
IED	Improvised Explosive Device
IO	Information Operations
IRA	Irish Republican Army
IRC	Internet Relay Chat
ISAAC	Irreducible Semi-Autonomous Adaptive Combat
ISF	Iraqi Security Forces
ISR	Intelligence, Surveillance, and Reconnaissance
IT	Information Technology
JFCC NW	Joint Force Component Command Network Warfare
JFT GNO	Joint Task Force Global Network Operations
JIEDO	Joint IED Defeat Organization
KM	Knowledge Management
M&S	Modeling and Simulation
MBM	Multiagent-Based Model
MCO	Military Corporation Office
MNFI	Multinational Forces Iraq
MOE	Measures of Effectiveness
MOP	Measures of Performance
NATO	North Atlantic Treaty Organization
NCIC	National Crime Information Center

NCTC	National Counterterrorism Center
NETWARCOM	Naval Network Warfare Command (U.S. Navy)
NGO	Nongovernmental Organizations
NIAC	National Infrastructure Advisory Council
NIC	National Intelligence Council
NIPP	National Infrastructure Protection Plan
NSC	National Security Council
NSD-42	National Security Directive-42
NYSE	New York Stock Exchange
ODI	Office of the Director of National Intelligence
ODPA&E	Office of the Director, Program Analysis and Evaluation
OFW	Oblique Flying Wing
OIF	Operation Iraqi Freedom
OODA	Observation, Orientation, Decision, and Action
ORCLE	Optical and Radio Frequency Combined Link Experiment
OSD	Office of Secretary of Defense
OUSD(P)	Office of the Undersecretary of Defense for Policy
PA&E	Program Analysis and Evaluation
PC	Personal Computer
PPBE	Planning, Programming, Budgeting, and Execution
PPBS	Planning, Programming, and Budgeting System
PRC	People's Republic of China
PSI	Proliferation Security Initiative
QDR	Quadrennial Defense Review
R&D	Research and Development
RF	Radio Frequency
SALTI	Synthetic-Aperture Ladar for Tactical Imaging
SCADA	Supervisory Control and Data Acquisition
SIAC	Science Applications International Corporation
SIGINT	Signal Intelligence
SINCGARS	Single-Channel Ground and Airborne Radio System
SIPRNET	Secret Internet Protocol Router Network
SME	Subject Matter Expert
SOF	Special Operations Forces
SOTCAC	Self-organized Terrorist, Counter-terror Adaptive Coevolution
SSP	Sector-Specific Plan
SSTR	Security Stabilization, Transition, and Reconstruction
SWIFT	Simple Web Interface Toolset
TCP/IP	Transmission Control Protocol/Internet Protocol

TRAC	TRADOC Analysis Center
TRADOC	Training and Doctrine Command
TSAT	Transformation Communications Satellite
TSWG	Technical Support Working Group
UAV	Unmanned Aerial Vehicle
UBL	Usama bin Laden
URW	Unrestricted Warfare
US-CERT	United States Computer Emergency Readiness Team
USSOCOM	U.S. Special Operations Command
USSTRATCOM	United States Strategic Command
VHF/UHF	Very High Frequency/Ultra High Frequency
WMD	Weapons of Mass Destruction
XG	neXt Generation