5th Nuclear Stability Roundtable: "Strategic Stability in a Turbulent World"

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Christine A. Cleary
Alexis B. Delaney
Rapporteurs

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SUPERVISING PROJECT OFFICER: Mr. Larry Sanders, Advanced Concepts and Technologies Division, ASCO, DTRA, (703) 767-5715.

NUCLEAR STABILITY ROUNDTABLE STEERING COMMITTEE: The Nuclear Stability Roundtable Steering Committee developed the agenda for "Strategic Stability in a Turbulent World" and reviewed and selected abstracts and presentations. The DTRA component of the Steering Committee reviewed the minutes contained in this report. Members of the Steering Committee are listed below.

Mr. Larry Sanders, DTRA, Chair
Dr. Rodney Jones, DTRA
Dr. Jeffrey Milstein, DTRA
Dr. Robert Batcher, DOS
Dr. Thomas McIlvain, DOS
Mr. Patrick McKenna, USSTRATCOM
Mr. Dennis Powell, LANL

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION: 1710 SAIC Drive, McLean, Virginia, 22102. Telephone: (703) 676-5550. Project Coordinator: Mr. Gregory Giles, Assistant Vice President & Manager, Advanced Concepts and Strategic Assessments Division, (703) 676-6408.

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Executive Summary

Objectives

This report is a summary of the Fifth Nuclear Stability Roundtable, *Strategic Stability in a Turbulent World*, held on 28-29 April 2003. It describes the presentations given at the workshop, key insights into today's strategic stability environment, and identifies areas for future discussions, debate, research, and analysis in the international security field.

History and Purpose

The Nuclear Stability Roundtable is co-sponsored by the Defense Threat Reduction Agency (DTRA), the Department of State, U.S. Strategic Command, and Los Alamos National Laboratory. The Advanced Systems and Concepts Office of DTRA hosted this year's roundtable. The goal of this year's Nuclear Stability Roundtable Steering Committee was to stimulate discussion of how stability calculations should change in light of the volatile international climate. The roundtable sought to evaluate the pivotal developments in U.S. attitudes toward nuclear stability, as marked by the Administration's Nuclear Posture Review and recent policy documents such as the National Security Strategy and the National Strategy to Combat Weapons of Mass Destruction. The roundtable also served as a forum to discuss the early implications of Operation Iraqi Freedom, as well as the continuing response to the terrorist attacks of September 11, 2001. Participants represented a wide array of expertise, from military operations research and modeling to the social sciences and policymaking community. Twenty presentations were selected from a pool of submitted abstracts to share recent research on pressing stability issues. The presentations were assembled in the following panels:

- Preemption and Stability
- Regional Challenges
- Nuclear Posture Review
- Emerging Strategic Powers
- Modeling and Predicting Strategic Stability
- Novel Approaches to Modeling Stability
- Enhancing Deterrence Stability

Panelists' presentations evoked much discussion among the participants and framed important issues such as:

- What are the limits of deterrence as we deal with emerging threats?
- How can we gather enough information about the idiosyncrasies of an opponent in order to guide policy and bolster deterrence?

- How will the recent policy decisions of the Bush administration, such as the preventive war in Iraq and current implementation of the Nuclear Posture Review (NPR) impact strategic stability?
- How can traditional and novel approaches to modeling help us address stability challenges?
- How can analysts "package" their tools and research in such a way that they are useful to policymakers?

As a result of the two-day session, participants had new concepts and tools to ponder and new areas of research and analysis on which to impart. Some of the key recommendations that resulted were:

- Incorporate flexibility and adaptive planning into traditional concepts of deterrence. In addition to deterrence, consider the operational utility of such concepts as assurance and dissuasion.
- Improve aspects of threat anticipation by making a concerted effort to understand the idiosyncrasies that drive an opponent's decision-making.
- Contemplate new approaches to continuing problems, such a proliferation and the security of command and control systems.
- Consider new ways to model multi-polarity and balance offensive and defensive systems.
- Consider the stability implications that may result from the integration of the New Triad and the implementation of the NPR.

Keynote Address: Dr. Keith Payne, Deputy Assistant Secretary for Forces Policy, Office of the Secretary of Defense

Background

Dr. Payne's responsibilities include policy and programs relating to U.S. nuclear and strategic forces, U.S. ballistic missile defense forces, nuclear weapons safety and security issues, and strategies for advanced technologies programs. His office is also responsible for enhancing nuclear test readiness and implementing the Nuclear Posture Review (NPR).

Key Insights

Dr. Payne began by noting that the Nuclear Stability Roundtable's timely consideration of the issues of stability and deterrence is relevant to the responsibilities and work underway at the Office of the Secretary of Defense. Dr. Payne's address touched upon three main themes:

(1) The insufficiency of deterrence in addressing current and emerging threats U.S. national security.

(2) The need to better understand the cultural dispositions of our opponents.

(3) The need to develop more flexible and adaptable means of strategic planning.

Dr. Payne began by referencing Herman Khan, whose work on deterrence and stability has remained one of the seminal sources of deterrence theory to this day. Deterrence and stability were traditionally considered to be functions of strategic capability and target sets. Policymakers looked to sophisticated quantitative tools, set methodologies, patterns, and debates in order to draw conclusions about the opponent's capability and targets. For example, during the Cold War, debates about SALT I and II and the ABM Treaty were elements of one such framework for understanding Soviet strategic forces and target sets, and policymakers turned to them for stability answers. However, conclusions based on target sets and forces alone are no longer a sufficient approach to deter other countries or actors from threatening U.S. national security.

Dr. Payne argued that the old approach to deterrence was, perhaps, reflective of U.S. cultural dispositions. Most policymakers ventured that others' actions and views were the same as ours. This approach, however, is problematic.

For example, in the Cold War tradition of deterrence, Washington sought to deter another country by threatening its population, economic bases, and its leadership. This strategy was highlighted by Secretary McNamara's declarations of "Assured Destruction" and further supported in 1974 when President Nixon signed National Security Decision Memorandum (NSDM) 242. This strategy rested on the assumption that the opponent had a Western style of leadership. Therefore, the threats communicated by U.S. leaders

were aimed at political leadership who, above all, were assumed to value the well being of their country and population.

Not all leaders, however, are intrinsically concerned with the well being of their citizens. Rather, a few leaders may view their population as "tools" to advance their personal goals. For example, Stalin referred to his citizens as "nuts and bolts." Similarly, Mao asserted that the loss of 300 million Chinese in a nuclear war would be "no big deal." More recently, Iraq's Saddam Hussein demonstrated his lack of concern for his citizens while using women and children as pawns in his war strategy.

If the well being of a populace is not a vehicle for deterrence, perhaps the life of the leader will be the determining factor? Dr. Payne argued that this theory, too, does not necessarily hold for other countries. He listed a few historical examples, such as Castro's willingness to face death during the Cuban missiles crisis as a means to see capitalism punished and socialism triumph.

Another problem with Cold War deterrence is the fundamental assumption that opponents would make decisions based upon maximizing utility. This assumption does not account for leaders who are governed by other factors in decision-making, such as a "prophetic image." For example, in 1918, Hitler had a "heavenly vision" and cautioned his inner circle to not let analysis get in the way of the "voice in your head." Much the same, Hitler decided to terminate the V2 program because of a bad dream. In recent years, Saddam Hussein based his invasion of Kuwait on a dream. Such "fortune telling" cannot be accommodated in the deterrence paradigm.

Dr. Payne argued that past experiences have allowed U.S. policymakers to attach confidence to the functioning of deterrence. However, the current challenge is to predict the decision-making of a group or single leader whose value and judgment metrics differ greatly from our own. Idiosyncrasies often can drive decision-making for those individuals, making the projection of the outcome of deterrence difficult.

Dr. Payne posed some questions to the participants:

- How useful are abstract concepts of deterrence when they are separate from specific opponents and strategy? In the Cold War, we considered ourselves "masters" of deterrence, but perhaps our success may have been a result of favorable circumstances.
- Can we gather enough information about the idiosyncrasies of an opponent in order to guide policy? If so, how can this be done and how can the information be "packaged" in such a way as to make it useful for policymakers to digest?

Dr. Payne ended his address by noting that despite the forgoing discussion, the practice of deterrence is still essential to United States security. However, we need to approach deterrence free from the blinders of the Cold War, in order to make more informed judgments. Towards this end, the 2001 NPR acknowledged the importance of deterrence and opened discussion about how to make it more reliable. A few basic conclusions have been reached:

- We must do more to balance offense with defense in order to prepare for the failure of deterrence; and
- We must practice deterrence in a more flexible and adaptable way to accommodate a range of factors that may drive opponents' decision-making.

Discussion and Areas of Future Consideration

One participant asked Dr. Payne to explain the existing rationale for maintaining the nuclear weapons reserve. Dr. Payne discussed the need for a "responsive capability" in order to respond to any challenges to deterrence that may emerge in the future. Therefore, the United States must be flexible and adaptable, in case such future challenges warrant a response with more than the current operationally deployed force.

Another participant discussed the need for a conceptual framework to expand thinking on how to incorporate dissuasion into deterrence theory. Dr. Payne agreed and offered a definition of dissuasion. Dissuasion takes place in the period prior to active deterrence and encourages countries not to invest in WMD. The concept includes the ability to structure the force posture and infrastructure in a way that discourages an adversary from military or arms race competition. Similarly, missile defense is, in part, designed to dissuade by discouraging countries from moving forward with missile production.

Another participant argued that, in his opinion, the Nuclear Posture Review (NPR) was a conservative and cautious doctrine. He claimed that the NPR did not clearly discuss how nuclear weapons relate to the current strategic situation. Specifically, he wondered if the responsive force is suitable for likely future scenarios. For example, how would nuclear weapons feature in a regional contingency, where limited collateral damage is important? The participant argued that the development of the Robust Nuclear Earth Penetrator (RNEP) and current efforts to develop advanced science and computing initiatives is a step in the right direction, but that U.S. policymakers still have many issues to work through.

Dr. Payne agreed that the legacy nuclear forces were not designed for regional contingencies. The New Triad was an attempt to respond to the shortcomings of the legacy force, and thus, the New Triad incorporates missile defense and infrastructure as legs and increased the importance of advanced conventional strike. He concurred that the NPR is a "cautious" doctrine, a reflection of an unpredictable international environment.

Panel I: Preemption and Stability

Introduction

The facilitator of Panel I was Mr. Larry Sanders, from the Defense Threat Reduction Agency's Advanced Systems and Concepts Office. Panel members included the following:

- Dr. Michael Wheeler, Science Applications International Corporation (SAIC)
  Preemption, Legitimacy, and Stability: Some Organizing Principles

- Dr. Kerry Kartchner, U.S. Department of State
  Missile Defense as an Alternative to Preemption

Background

The objective of the Preemption and Stability panel was to outline the current debate and evaluate the implications of the Bush Administration's doctrine of preemption. Dr. Wheeler examined the stakes in the current debate over preemption and explored what he assessed as the Bush administration's definition of preemption. Dr. Kartchner's presentation examined the relationship among missile defense, prevention, and retaliation.

Key Insights

Dr. Wheeler's presentation, "Preemption and Legitimacy: American Power and the Future World Order," considered several key questions:

- What does the Bush doctrine of preemption mean?
- How does preemption fit into the evolving norms of international conflict?
- What does just war theory have to say about preemption?
- Can a new concept of preemption be formulated that is accepted as legitimate by our friends and allies and by much of the rest of the world?
- If not, what are the prospects for stability in the emerging world order?

Dr. Wheeler began his presentation by evaluating the relationship of legitimacy to stability and highlighting the general historical aversion to the notion of "might makes right." These issues were linked to the Bush Administration's policy of preemption, which was announced several times in 2002. Dr. Wheeler noted that American official thinking on preemptive and preventive military actions is not new, however the traditional frameworks and concepts in which preemption is considered might need to be adapted to accommodate the nature and capabilities of today's threats. The commencement of Operation Iraqi Freedom put the policy of preemption in action and thus fueled the debate about the legitimacy of the Administration's actions, both domestically and abroad.

In his presentation, Dr. Wheeler framed the current discussion by tracing historical instances of the where the United States had preserved the right to act preemptively, including the Cuban missile crisis of 1962 and the crisis on the Korean peninsula in 1994.

To further understand the legitimacy of the doctrine of preemption and its relationship to stability in world politics, Dr. Wheeler reviewed certain key relationships:

- Preemptive military action and contemporary international law;
- Preemptive military action and Just War Theory; and
- Preemptive military action and first use of nuclear weapons.

In his discussion of the relationship between preemptive military action and contemporary international law, Dr. Wheeler introduced key concepts within this framework, including:

- Reactive defense;
- Anticipatory self-defense; and
- Preemptive self-defense.

He highlighted these concepts because they will be significant in future efforts to reconstitute the United Nations and key elements of Charter law.

The Just War Theory features in the preemption debate because it addresses the legitimization of violence. Within this theory there are two major types of issues: *jus ad bellum* (moral legitimacy of going to war) and *jus in bello* (legitimacy of actions during war). *Jus ad bellum* includes the notions of competent authority, just cause, last resort, right intention, proportionality between ends and means, and prospects of success. *Jus in bello* considers discrimination, proportionality, and military necessity.

Dr. Wheeler presented these principles in the context of the current debate on Iraq, to further consider the legitimacy of preemptive actions. Dr. Wheeler offered that at a minimum, the *jus ad bellum* principles demonstrate a strong hesitation on the part of many to morally endorse a war fought to prevent an uncertain future from unfolding, as opposed to a war to counter clear and imminent threats. He added that others believe that preventive wars could be reconciled with the *ad bellum* tradition in just war theory, if the conditions under which preventive wars were fought were narrowed. The relevance of the *jus in bello* principle to preemption is less clear; however, it is important in considering whether the Bush doctrine implies that the United States intends to use nuclear weapons preemptively as it prosecutes a war.

From his analysis of the legitimacy of first use of nuclear weapons, Dr. Wheeler concluded that while nuclear first use is retained in American policy as an option, it is neither an easy nor an automatic option. He argued that preemptive use of nuclear weapons does not appear to be what the National Security Strategy had in mind when it elevated preemption to a central role.

After discussing the various facets of the preemption debate, Dr. Wheeler offered some observations regarding American power and the future of world order. He noted that if Americans come to question the legitimacy of how American power is deployed and

displayed abroad, it would most likely weaken the stability of the world order. Dr. Wheeler furthered argued that, in order to legitimize U.S. power, a debate between the United States and the international community must occur. He recommended the rebuilding of institutions for major power cooperation. Reinvigorating and reshaping nonproliferation regimes, especially for nuclear weapons, should be considered, as should a strengthened international effort in the war on terror. Finally, Dr. Wheeler offered that we should engage responsibly and objectively in the Middle East peace process.

Dr. Kartchner's presentation, *Beyond Preemption or Retaliation: The Potential Contributions of Missile Defense to Deterrence* examined the relationship among missile defense, prevention, and retaliation. He argued that there were numerous pitfalls associated with relying on either prevention or retaliation. Dr. Kartchner began by citing a recent editorial that argued that there was no need for missile defense, because missiles could be destroyed preemptively as a missile was being assembled for launch. He argued that this was a flawed assumption because the purpose for the launch might be ambiguous (e.g., space launch).

Dr. Kartchner observed that without missile defense or other forms of damage limitation, the only remaining options are preemptive attack or retaliation. Both the threat of preemptive attack and retaliation are current pillars of deterrence – and both have been advocated as alternatives to missile defense.

Dr. Kartchner cautioned against too heavy a reliance on preemption, in light of the difficulty of fulfilling the requirements of successful preemption. These requirements include:

- Actionable intelligence – including the ability to identify targets in a timely manner;
- Available and appropriate weapons – that are decisive over long-distances; and
- Demonstrable justification – that can legitimize a preemptive attack; even if the rationale comes after the strike.

Given the difficulty in meeting all of these requirements simultaneously, Dr. Kartchner lauded the benefits of missile defense as a hedge against political risk and military uncertainty.

Retaliation has limits as well. Despite substantial early-warning capabilities, policymakers cannot assume that a "return address" will always be known. Secondly, retaliatory options may not always be proportional, appropriate, or militarily available. Finally, basing deterrence strategy on a militarily unavailable or morally unsustainable retaliatory option undermines the credibility of that deterrence.

The crux of Dr. Kartchner's argument was that missile defense, or damage limitation capability more broadly, can be a potential alternative to preemption or retaliation. He concluded that the ability to limit damage to one's homeland, friends, allies, and forces deployed abroad can enhance deterrence and provide an alternative to the risks of preemption, or the limits of retaliation.

Discussion and Areas of Future Consideration

Participants discussed the distinction between preemptive and anticipatory actions. Historically, preventive war did not take hold because policy-makers did not think that it could succeed. The issues of anticipatory action and preemptive war are embodied in recent concerns about North Korea becoming a nuclear state. Dr. Wheeler argued that the implications of a nuclear DPRK are very different than the implications associated with Iraq. Furthermore, it would be very difficult to execute a preemptive war plan against North Korea that would not have severe consequences for Japan and South Korea.

Other participants were interested in Dr. Wheeler's proposition about Washington taking the lead in formulating a new legal regime governing the use of force. One participant linked the proposition to efforts to combat terrorism. He wondered whether it would ever be possible for special operations teams to enter sovereign territories and extract terrorists. Would the regime in question accept U.S. claims of anticipatory self-defense as sufficient justification for military action?

Other participants asked if the legal regime would be comprised of treaties or if it would take more of a customary international law format. Dr. Wheeler suggested that it would more likely resemble the latter.

With respect to Dr. Kartchner's presentation, a participant noted that the deployment of missile defense increases an adversary's uncertainty about achieving his objectives through the use of offensive forces while simultaneously increasing the cost to him of trying to overcome those defenses. Dr. Kartchner was also asked if he had determined the level of missile defense necessary to provide deterrence (or dissuasion) to a state in the beginning development stages of ICBM capability while avoiding an arms race with states that already have this ability. Dr. Kartcher replied he had not yet determined the level of missile defense required for this scenario.

Another participant was of the view that no missile defense provides 100% reliability against the threat of unacceptable damage. Dr. Kartchner agreed, but argued that it was demonstrated in game-theoretic scenarios during the Cold War that missile defenses with 20-40% effectiveness could be a deterrent to the Soviet Union. Similarly, the recent performance of the Patriot system in Iraq had a deterrent effect, even if it was not 100% effective.

Finally, it was asked if the U.S. deployment of missile defenses would encourage adversaries to pursue chemical or biological weapons as a counter. Dr. Kartchner added that he views the development of CBW as separate from the implications of missile defense because most likely, the adversary is already pursuing such capabilities.

Panel II: Regional Challenges

Introduction

Dr. Jeffrey Milstein, of the Defense Threat Reduction Agency's Advanced Systems and Concepts Office, moderated the second panel. The panelists evaluating current regional challenges where:

- Ms. Kristi Branch, Pacific Northwest National Laboratory
  Stability Model of Northeast Asia

- Mr. Peter Wilson, RAND
  East Asian Stability Challenges

Background

Panel II's objectives were to evaluate regional challenges to strategic stability that are currently emerging or that may emerge in the future. Ms. Branch's presentation described a model that examined stability in the Northeast Asian region in particular. Similarly, Mr. Wilson's presentation identified certain political-military events in Northeast Asia as examples of "punctuated equilibrium" and evaluated some of the potential implications for stability.

Key Insights

In her presentation, *Modeling "Stability" in Northeast Asia*, Ms. Branch described the study methodology, which featured the application of the Situational Influence Analysis Module (SIAM™). For modeling purposes, Northeast Asia was defined as China, Japan, North Korea, South Korea, and the Russian Far East. The model established certain "pillars of stability" and addressed conditions and events in the next three to five years. In addition, the model assigned judgments and values from the perspective of the Asian country, rather than a U.S. perspective. This aspect of the model produced a more comprehensive view of stability, which avoids "surprises" and artificial constraints when seeking regional security solutions.

The "Pillars" of Stability

- Military
- Regional Politics
- Economics
- Domestic Politics
- Environment
- Culture
- Demographics

The SIAM software tool implements a modeling process called "Influence Networks." This process is a combination of two modeling techniques: influence diagramming and Bayesian Inference Networks. The tool facilitates recognition and evaluation of important distant (or seemingly unconnected) relationships by breaking down complicated issues of cause-and-effect into their fundamental components. After the components are disaggregated, the next step involves the incorporation of fact-based information, expert judgments, levels of confidence, and

degrees of uncertainty into the influence net. SIAM then generates alternate future scenarios to:

- Examine "what if" implications;
- Look at the relative impact of contributing events;
- Determine the sensitivity of desired outcomes to their contributing events; and
- Keep track of source materials and background information.

Ms. Branch said that the next steps in the project would include updating the model in order to assess the stability implications of a range of policy choices. In turn, the model will serve as a realistic basis for scenarios and war games, and develop criteria for U.S. assistance and intervention in certain regions. Furthermore, the model may be altered to fit other regions such as South Asia (particularly the Philippines and Indonesia) or Central Asia.

Mr. Peter Wilson of RAND presented *Does "Strategic Stability" Have a Future in Northeast Asia?* Mr. Wilson argued that Northeast Asia is going through a dramatic political-military crisis, or "punctuated equilibrium" (i.e., historical discontinuity). The events in the region that comprised the punctuated equilibrium were driven by the DPRK's admission in October of 2002 that it had a secret uranium enrichment program. He also presented several different outcomes to the current negotiations that are underway between Washington, Pyongyang, and Beijing, and the implications for near- and medium-term stability of Northeast Asia.

Mr. Wilson began by describing the geo-strategic and economic environment in Northeast Asia prior to October 2002. Mr. Wilson depicted the region as a complex Rubik's cube, with increasing interaction between China, Japan, and the Korean peninsula. These interactions may cause dramatic change in the region and have the potential to create serious "fault lines" in policy. During this period, the United States served as a regional military balancer or "reassurer" and was the market of choice for East Asia. Also during this time, Russia was a potential major supplier of oil and natural gas to Northeast Asia. Ultimately, Mr. Wilson argued that the landscape that he presented was an unstable geo-strategic and geo-economic regional environment.

The current nuclear crisis on the Korean peninsula, Mr. Wilson argued, can only be understood in the context of larger geo-strategic discontinuities. Mr. Wilson then observed that the end of the Cold War marked the end of the "first" nuclear era. The current historical discontinuity spans the events of September 11th and includes the recent war in Iraq. He claimed that U.S. policy choices during this period might bring about significant regional change. These changes could include transformation of the U.S. global alliance system or could become evident in potential crises, e.g., an Indo-Pakistani war or Iranian acquisition of nuclear weapons.

Mr. Wilson's primary example, however, was the North Korean nuclear crisis. He presented two possible near-term outcomes:

1) "The Grand Bargain"; or
2) Nuclear breakout by the DPRK.

The first outcome would feature a bilateral non-aggression agreement between the United States and the DPRK and/or a multilateral agreement involving Washington, Beijing, Moscow, Tokyo, Seoul, and Pyongyang. The second option would see DPRK deployment of nuclear weapons, with two potential results – either the continuation of the Sunshine Policy by the ROK, or the collapse of negotiations between the two countries.

Either of these outcomes would impact the stability of the region. Mr. Wilson argued that one potential outcome could be the disintegration of the Nuclear Nonproliferation Treaty (NPT) and the dawn of the "second" nuclear era, an era of accelerating nuclear proliferation, rogue states or independent agents with chemical, biological, radiological, and nuclear weapons (CBRN), and non-deterrable threats. The near-term implications for strategic stability could include:

- New mix of "strategic" nuclear offensive and defensive systems coupled with non-nuclear offensive systems,
- Strategic stability or "equilibrium" increasingly defined by complex geo-strategic and geo-economic parameters,
- Future regional and global nuclear equilibrium calculations will be of multi-national character, or
- The non-nation state actor as the new "disturber" of "strategic" stability.

Discussion and Areas of Future Consideration

One participant asked Ms. Branch if the Northeast Asia model produced any results that were counter-intuitive. Ms. Branch responded that the model's results were consistent with the assignment of relative priority to each factor. Another participant asked that when identifying the pillars of stability, how does the model avoid the possibility that military considerations may overwhelm other factors? Ms. Branch responded that it is possible to cross-link the pillars so that the relative importance of the military considerations would be evident. Once participant praised the model's consideration of non-traditional elements of stability, such as health, environment, and demographics.

Mr. Wilson was asked if he thought any intervening factors, such as changes in United States policy might alter negative proliferation trends. Mr. Wilson suggested that the situation in North Korea might be an unalterable course. He questioned whether Washington would be comfortable living with greater proliferation and thought perhaps the United States might take drastic action in the form of regime change. Another participant brought up the issue of non-state actors and their role in U.S. policy-making and regional stability. Mr. Wilson offered that he found the Iraq/al-Qaeda link to be dubious. He claimed that prior to Operation Iraqi Freedom, Russia, France, and China undermined the dual-containment policy towards Iraq. The disintegration of this policy motivated the Bush Administration to destroy the Iraqi regime. He noted the difference between the case of Iraq and the case of North Korea. One particularly noteworthy difference is North Korea's location and the implications of this country having a CBW and emerging nuclear capability.

Panel III – The Nuclear Posture Review

The topic of the third panel of the Nuclear Stability Roundtable was the Nuclear Posture Review. Mr. Pat McKenna of STRATCOM chaired the panel. The panelists included:

- Dr. Michael Simon and Mr.Guy Grundman, SPARTA, Inc.
  Unintended Consequences of Strategic Adaptability

- Colonel Valery Yarynich, (Retired, Russian General Staff);
  Visiting Scholar, University of California San Bernadino
  Protection From Sabotage Through Modeling

- Professor David Yost, United States Naval Postgraduate School
  Alliance Relations and Concepts of Assurance, Deterrence, and Dissuasion

Background

The objective of this panel was to evaluate the applicability and the ramifications of the Bush Administration's Nuclear Posture Review. Dr. Simon and Mr. Grundman outlined the relevance of modeling strategic adaptability in their presentation. Colonel Yarynich addressed the need to better protect Russian and U.S. strategic infrastructure, with one possible method of modeling. Professor Yost examined the impact of the Bush Administration's strategic posture on Alliance relations.

Key Insights

The 2002 Nuclear Posture Review includes a pivotal "strategic adaptability" component. Under this approach, the United States will reduce its operational nuclear forces but retain a "responsive" force of reserve nuclear weapons to meet challenges posed by either a change in the status quo or the emergence of a strategic competitor. In the panel's first presentation, *Unintended Consequences of Strategic Adaptability*, Dr. Simon and Mr. Grundman argued that maintaining a strategic reserve could potentially produce unintended consequences, such as an unintentional rivalry between the United States and Russia.

The SPARTA model takes a closer look at how potential adversaries might react to the advantages that the United States would gain through a strategic nuclear reserve. The evaluative process involved the modeling and tracking of the state's *conventional* active and reserve forces as an index for assessing the implications of a state's *nuclear* active and reserve forces. The components included:

- A game-theoretical model specifically tailored for the strategic situation in question.
- Empirical tests tracking conflict through history.
- Specific country profiles (In this case, Russia and China).

From the first component, the specifically tailored game-theoretical model, the following testable hypothesis was derived: maintaining a strategic reserve actually *reduces* conflict (within the model). This hypothesis was supported by the results of the empirical tests that were run for Russia and China. One of the most significant findings of the study indicated that the geographic distance between two states reduces the likelihood of conflict.

The country profiles characterized Russia as a familiar adversary and a traditional nuclear competitor, currently engaged in primarily qualitative improvements and seeking to maintain relative parity with the United States. Regarding the Nuclear Posture Review, Russia has been restrained in its criticism.

Conversely, China is viewed as a new competitor, while seeing itself as an ascending power. Engaged in both qualitative and quantitative improvements, China is also suspicious of U.S. aims, but currently defers to U.S. policy. According to Simon and Grundman, China views the Nuclear Posture Review as part of a cumulative national security posture and, therefore, does not see the U.S. nuclear reserve as an isolated variable.

Based on the findings produced by SPARTA's study, the United States reserve nuclear force should have positive, albeit limited, impact on potential adversaries. The impact will be positive in that strategic adaptability may reduce conflict severity (this is supported by the game-theoretical model). The model also implies that more reserve strength serves as a greater indicator of a deterrence-oriented strategic posture. The impact, however, will also be limited in that other states do not view strategic adaptability in isolation. In order to better predict the actions of its competitors, the United States must view strategic adaptability within the context of its overall national security strategy and actions.

In his presentation, "Protection From Sabotage – Through Modeling," Colonel (Retired, Russian General Staff) Valery Yarynich discussed Command, Control, and Communication (C3) Systems. In his opinion, C3 systems are problematic in that:

1. No firm confidence on the part of nuclear powers exists regarding reliable protection of the nuclear control systems from accidents and sabotage.
2. Assessments of mutual deterrence prevent the barrier of mistrust between countries from being overcome.

Colonel Yarynich argued that there is a concealed danger within the constructs of C3 systems. The specific feature of this problem is that any nuclear power's assurances of "absolute" safety of their national control systems cannot be totally convincing for other countries. He added that the clearly unacceptable nature and scale of consequences from sabotage in this area requires not only mutual trust, but also reliable knowledge. Only C3 experts, working jointly, can provide this necessary knowledge to their political leadership.

There are two main obstacles in the way of C3 cooperation:

1. Fear of exposure of the weak points in the national C3 protection system(s).

2. In the area of negative C3 control (ensuring against unauthorized access/use), the potential for specialists of the other country to penetrate the area of positive control (ensuring that orders are successfully communicated and executed).

There are two ways to overcome this resistance to cooperation in the area of C3. First, each country could clearly separate the negative control information on battle features of their C3 system. There is another way, however, which can be employed simultaneously and which will provide for more open C3 cooperation. The approach is to model a hypothetical nuclear conflict, while simultaneously ensuring the safety of each data exchange on C3 systems, at least to the degree needed for efficiently resolving the issue of improving the negative control.

Thus, joint modeling of a nuclear war may provide for achieving the main goal – establishment of cooperation in negative C3 control, and eventually increase the level of protection of control systems of the two nuclear superpowers.

Colonel Yarynich proposed an approach to modeling, somewhat based on the late-1980's – early-1990's unilateral approach. In statistical models of nuclear war after multiple runs of some single scenario, a data array of various results of retaliation is obtained and used to assess the reliability of deterrence for this scenario. Particularly important in the framework of these models is that, among this data array of results, "atypical" and "non-characteristic" outcomes are always present. Such non-characteristic results are sometimes called "tails." These "tails" are the most essential, because their existence is critical to the deterrence equation.

In terms of a new formula for deterrence, it must be recognized that in practical terms, a nuclear war can happen only *once*. There is no guarantee that this particular atypical, yet rather unacceptable, retaliation will not occur at the very first (and only) real try. Strictly mathematically, the probability of an unacceptable event should be equal to zero.

In developing C3 cooperation, the main obstacle to joint investigations in the area of control of nuclear weapons is the issue of secrecy of data about C3 systems. In order to overcome this obstacle, the following steps can be recommended:

- Extend open publications on the subject of control of nuclear weapons, particularly in Russia.
- Establish a group of official C3 experts from both countries with the purpose of answering one question – is it possible to develop joint actions in order to enhance negative control (to increase protection of C3 systems against sabotage) without undermining the integrity of positive control in each country?
- Start, on an unofficial level, joint work of independent C3 experts from the United States and Russia (probably also specialists from other countries) on modeling a nuclear conflict.
- After proving the hypothesis of stability of mutual deterrence, prepare a joint report to the leaders of both countries with the proposal to start a detailed joint modeling on the official level, with phased approximation of the initial data on nuclear forces and their control systems to the maximum realistic level.

Colonel Yarynich proposed that the ideal C3 system would include the democratization of the main decisions, as the United States and Russia decide their fates together. Another ideal solution would be a situation in which a permanent bilateral United States – Russia (or multilateral) body exists to estimate the level of deterrence (i.e. magnitude of the retaliation risk) for each nuclear state.

Following on the theme of the Nuclear Posture Review and its impacts on traditional concepts of deterrence, Professor David Yost of the United States Naval Postgraduate School discussed "Alliance Relations and Concepts of Assurance, Deterrence, and Dissuasion." This presentation addressed the implications of the new U.S. concepts of defense and security, particularly assurance, deterrence, and dissuasion for the European Allies.

Professor Yost argued that these implications could be addressed in two ways:

- What do Allies think of these concepts?
- What is the significance for Allies of these concepts?

The United States has historically not regarded its Allies simply as dependents and protégés – that is, recipients of defense and security services from the U.S. military. The United States has encouraged its Allies to contribute to the defense and security of the Alliance as a whole. The United Kingdom, for example, is the ally with which the United States has had the closest relations, including in nuclear weapons matters. On the other hand, the United States was initially less inclined to welcome the French nuclear weapons program. Americans (and others) had worried about how French nuclear weapons could complicate central management of a crisis or war with the Soviet Union. This stance shifted over time to emphasize how multiple centers of nuclear decision-making could complicate Moscow's risk calculations and add to deterrence.

Professor Yost maintained that these arrangements are intended to contribute to deterrence, but they also support dissuasion and assurance. They support assurance to the extent that these multilateral Alliance arrangements bolster the confidence of Allies in the genuineness and reliability of U.S. nuclear capabilities and commitments. They support dissuasion to the extent that they convince Allies not to seek their own nuclear weapons and help to persuade the Alliance's adversaries not to seek nuclear arms.

Professor Yost then stated that it was imperative to recall that the New Triad defined in the NPR put nuclear and non-nuclear strike forces together in the same corner of the triangle. This part of the NPR has not been well-received, because many European observers have deep reservations about what they see as a U.S. tendency to pursue the "conventionalization" of nuclear weapons, to make nuclear arms more readily usable, even if this is intended to enhance the credibility of deterrence.

The next topic Professor Yost addressed was the significance of the concept of deterrence by denial, particularly as it concerns ballistic missile defense. He argued that some of the experts and officials in NATO countries that have endorsed the pursuit of BMD for the protection of populations and territories have done so on grounds other than confidence

in the theory of deterrence by denial. They have taken a more operational perspective that defenses could actually defend, and they could thereby give the United States and other Allies greater freedom of action in dealing with WMD proliferants armed with ballistic missiles.

Professor Yost then turned his discussion toward dissuasion. According to official definitions, "dissuasion" means to convince other powers to refrain from even initiating an "arms race" or competition in military capabilities with the United States. Official U.S. strategy documents suggest that dissuasion is achieved by convincing the adversary of the futility of competition with the United States, either on a general basis or in a particular category of military power, which could be nuclear weapons or fighter aircraft or nuclear attack submarines or anything else. The goal is to convince the adversary that it would be pointless to compete in the acquisition of military capabilities.

The next topic Professor Yost addressed was that of assurance. The QDR definition of the requirements of assurance refers not only to cooperation and U.S. overseas presence to back up the credibility of U.S. commitments, but also to "favorable balances of military power in critical areas of the world to deter aggression or coercion." In other words, the ability to assure is defined as a function of perceived ability to deter. Moreover, as suggested earlier, the ability to deter derives from one or both of the two forms of deterrence – a threat of punishment and/or a threat of denial. Denial, as noted earlier, means being able to deny the enemy the achievement of his operational objectives – as effective missile defenses might intercept and foil a missile attack. The capability to deter by denial is, in other words, closely related to the ability to defeat adversaries.

Yost argued that in order to assure Allies and security partners most effectively, the United States and its allies should have the capabilities to defeat their adversaries; and this ability should deter adversaries from attempting aggression or coercion and might even dissuade them from competing in the acquisition of military power.

To conclude, Professor Yost recommended future consideration of the potential tensions among the QDR goals:

- What is necessary to "deter" adversaries may not simultaneously "assure" allies or public opinion.
- What is necessary to "assure" allies and public opinion may undermine deterrence and diplomatic negotiating leverage.
- What is necessary to "dissuade" adversaries from acquiring military capabilities involves even greater uncertainties than deterrence; however, the "dissuade" function cannot take place unless adversaries know about U.S. capabilities.
- Successful "defeat" of the enemy may require secrecy about U.S. capabilities to achieve strategic and operational advantages in combat through surprise; secret capabilities, however, cannot contribute to "deter", "dissuade", or "assure" goals.

Discussion and Areas for Future Consideration

Following Dr. Simon's presentation, one participant inquired about the sequential equilibrium dynamic as applied to an expanded, three-player version. Dr. Simon

responded that the content of SPARTA's separate Stability Roundtable presentation on their *Strategic Offense, Defense, and Arms Control (SODAC) Model* addressed that specific question.

Another participant questioned the validity of the argument that Russian modernization has resulted in *qualitative* improvements. Mr. Grundman answered that the Russian *Topol* System has represents a qualitative improvement in Russian nuclear capability, although perhaps of a minor nature. The participant then asked why tactical nuclear weapons, though relevant, were not included in this study. The SPARTA team agreed that they are relevant, and, therefore, the topic will be explored further.

Regarding the results of the empirical tests, one participant conjectured that the outcome is a positive one for the United States, but questioned how other countries might interpret them, and whether the results might have arms race implications. Dr. Simon was hesitant to make any claims on this issue, on account of the fact that the study dealt primarily with the U.S. strategic *reserve* forces. The participant countered by asking whether the results would address the reserve issue in realistic way, based on the historical precedent of the mobilization of the German Wehrmacht in Poland in 1939. Dr. Simon responded that this particular example would cut against the data.

With respect to Col. Yarynich's presentation on C3 systems, one participant questioned the reliability of negative control. Col. Yarynich responded that the reliability of negative control was confirmed during the Cold War. He emphasized that in this era, characterized by terrorism, the antiquated Russian command and control system could threaten strategic stability.

Another participant questioned if C3 systems are vulnerable to electronic espionage. Col. Yarynich responded that the real danger is the system's overall vulnerability. The participant also inquired as to whether or not Colonel Yarynich was implying in his presentation that there should be more *glasnost* to promote C3 cooperation. Col. Yarynich suggested that public transparency might not necessarily be the best approach; however, information exchanges within a small circle of C3 specialists should achieve the necessary levels of cooperation.

Another participant raised the question of how to deal with the fact that there have been very few historical examples where formerly hostile peoples had to cooperate and share information to this extent. Colonel Yarynich explained that the most important thing would be to achieve a balance and use a leap of imagination in approaching the new U.S. – Russian relationship.

Panel IV : *Running for Sheriff – An Answer to WMD Proliferation*

Dr. Victor Utgoff, of the Institute for Defense Analyses, presented *Running for Sheriff – An Answer to WMD Proliferation?* In his presentation, Dr. Utgoff offered some thinking on what he sees as the most pressing question for global stability – "What is the nature of the long-term solution to the problem of continuing proliferation of weapons of mass destruction?"

Dr. Utgoff argued that continued proliferation of WMD seems likely, absent new measures that can decisively stop it. And, if it does not stop, instability and occasional devastating uses of these weapons seem inevitable. In order to avoid instability and wars with such weapons, he posits that sooner or later the United States will have to formally institutionalize and take on the role of "global sheriff." Such a sheriff, generally with the support of other nations, would intervene against interstate aggression. It would carry on strong programs to eliminate international terrorism, especially by terrorists attempting to obtain weapons of mass destruction. Effective prosecution of these tasks would require the cooperation and support of nearly all nations to succeed. Thus, the United States seems unlikely to be able to simply claim the office, but instead must run the equivalent of a global political campaign to win the office.

Dr. Utgoff argued that a state's strongest motivations to acquire WMD are to deter aggression against itself or to enable aggression against others. The global sheriff concept would undercut both motivations. By being willing and able to provide quick and reliable protection to all states, the sheriff would suppress both the need for WMD as a deterrent and the value of WMD for enabling aggression.

In order to play its stabilization role effectively, the global sheriff would be required to have clearly dominant military capabilities, including some WMD. In addition, to limit the risks that the sheriff would face in performing its duties, the strongest possible efforts would have to be made to detect and suppress new WMD proliferation efforts. And, most states that currently have weapons of mass destruction would be expected eventually to recognize that they are no longer needed and to give them up.

Specific duties that other states would need to carry out if the global sheriff concept is to be effective include:

- Support of intense counter-proliferation surveillance worldwide;
- Sharing of intelligence data on both suspected WMD proliferation activities and on terrorists that might seek WMD;
- Support of decisive action to halt revealed proliferation activities; and
- Meeting requests for contributions of forces, materials, and funds needed to support the activities of the global sheriff.

In light of the requirements and capabilities necessary to perform the sheriff's role, Dr. Utgoff argued that United States is clearly the most qualified candidate – due to its military strength, wealth, and its lack of interest in traditional empire building.

He then identified the primary challenge in demonstrating U.S. suitability for this role – assuring the world that the overwhelming military power that would be maintained by a global sheriff would not lead the US toward international tyranny. Dr. Utgoff suggested several ways by which the international community could be assured that the sheriff would not abuse its powers:

- Recognition that the overwhelming need to halt WMD proliferation cannot be met without widespread global cooperation – and that failure to gain and sustain this cooperation impose the greatest costs on the US;
- Codification of the responsibilities of all parties in international law; and
- Accountability to a suitable international organization.

Dr. Utgoff then made several comments on the nearer term implications of these arguments. He noted that the overthrow of Saddam Hussein and the assured end of his WMD programs is consistent with the behavior that will be needed in the long run from a global sheriff and its supporters. He added that although U.S. action faced international opposition, if this action had not been taken and an Iraq well armed with WMD had attempted aggression at some future date the world would have counted on Washington to confront it. Logically, the international community needs to understand and accept that minimally destructive actions must sometimes be taken by a global sheriff and its supporters in order to keep the cost of playing the sheriff role tolerable.

Dr. Utgoff went on to argue that the Bush Administration needs to make a broader and stronger case internationally that new policies are needed to decisively stop all proliferation of weapons of mass destruction. Still, pending the needed understandings and international agreements, the United States may have to carry out additional actions of the kinds that seem likely to ultimately be expected of a global sheriff. In taking such actions, Washington should interpret the requirements for action by a sheriff very conservatively, and when action is necessary, act in such a way as to build international confidence in the United States as the wisest and safest choice for the job.

In closing, Dr. Utgoff acknowledged that the global sheriff concept is an uncomfortable challenge to the sovereignty of all states. However, past non-proliferation and related arms control agreements were too weak precisely because of necessary features that were left out in order to avoid challenging states' sovereignty. He argued that continued proliferation of weapons of mass destruction – and the damage to civilization it would lead to – would be far too high a price to pay to avoid such challenges to the sovereignty of nations.

Panel V: Emerging Strategic Powers

Introduction

Dr. Rodney Jones of the Advanced Systems and Concepts Office of DTRA facilitated the fifth panel of the Stability Roundtable, the topic of which was Emerging Strategic Powers. The panelists delivering presentations on this topic were:

- Dr. Daniel Geller, University of Mississippi; Consultant, United States Department of State
  Power Cycle Theory and the Onset of War in South Asia

- Dr. Peter Lavoy and Brigadier General (Retired, Pakistan Army) Feroz Hassan Khan , United States Naval Postgraduate School
  Strategic Stability in South Asia

Background

The purpose of the Emerging Strategic Powers panel was to address the increasingly relevant issue of strategic stability in South Asia. Dr. Geller's presentation *Power Cycle Theory and the Onset of War in South Asia* applied a cyclical approach to examining the fluctuation of crises in the region, while Dr. Lavoy and Brigadier General Khan's presentation, *Strategic Stability in South Asia*, examined the recent historical nature and current status of the strategic conflict between India and Pakistan.

Key Insights

Dr. Geller opened his presentation, *Power Cycle Theory and the Onset of War in South Asia*, by noting that Power Cycle Theory was originally developed to explain and predict war between major powers at the apex of the global hierarchy. However, one can see its potential relevance in helping to account for conflict among states at lower levels of international status, wealth, and material capabilities. For example, the dyadic Indo-Pakistani military competition, according to Power Cycle Theory, cannot find any resolution except in a dynamic regional equilibrium involving China, India, and Pakistan.

Power Cycle Theory was first developed by Charles Doran of the School of Advanced International Studies (SAIS) at Johns Hopkins University, about 20 years ago. His thesis was that major powers move through a general, cyclical pattern with certain critical transition points characterized by capability growth, maturation, and decline. The pattern is a function of differential rates of development among the set of major powers. Capabilities are measured relative to the major power's total capability pool. Capability is measured as:

- "Size" – GNP, territory, military expenditures, population.
- "Development" – Per capita income, urbanization, technological sophistication.

The power cycle involves relative, not absolute capability. The relative capability of a major power at any time is the percentage of the total capability of all major powers under consideration at that time. Within the dynamic framework of relative capability there will be systemic structural changes in a single, unified process. Passage through a "critical point" in a major power's cycle of increasing and decreasing capabilities is associated with its initiation of full-scale or war.

Dr. Geller concludes that empirical studies at lower levels have shown that regional (subsystem) power cycles are more volatile than system-level cycles. As an example, shifts in the relative shares of the capability pool held by India, Pakistan, and China could move any or all of these states through critical points in their power cycles increasing the risk of war. As Dr. Geller noted, the most critical aspect of the South Asia power dynamic is that all three states possess nuclear weapons and, therefore, there is the potential for future catastrophic and long-term consequences.

In their presentation, *Strategic Stability in South Asia*, Dr. Lavoy and General Khan addressed the stability problems associated with India and Pakistan in the contemporary security environment.

In his summary of the nature of their current project, sponsored by the Advanced Systems and Concepts Office of DTRA, Dr. Lavoy identified the project goal as conducting a comprehensive analysis of the key elements that must be included in modeling strategic stability in South Asia. The specific objectives of this project: to analyze how conventional and nuclear deterrence operate between India and Pakistan; to identify elements of stability and instability; and to assess implications for United States policy.

Dr. Lavoy continued with a discussion of the Cold War's unresolved issues. He argued that although there may be merit in taking Cold War modeling and applying some of the relative aspects to Southeast Asia, no clear and applicable lessons were learned during the Cold War.

Dr. Lavoy then turned the discussion toward the concept of stability. He defined three main types of stability:

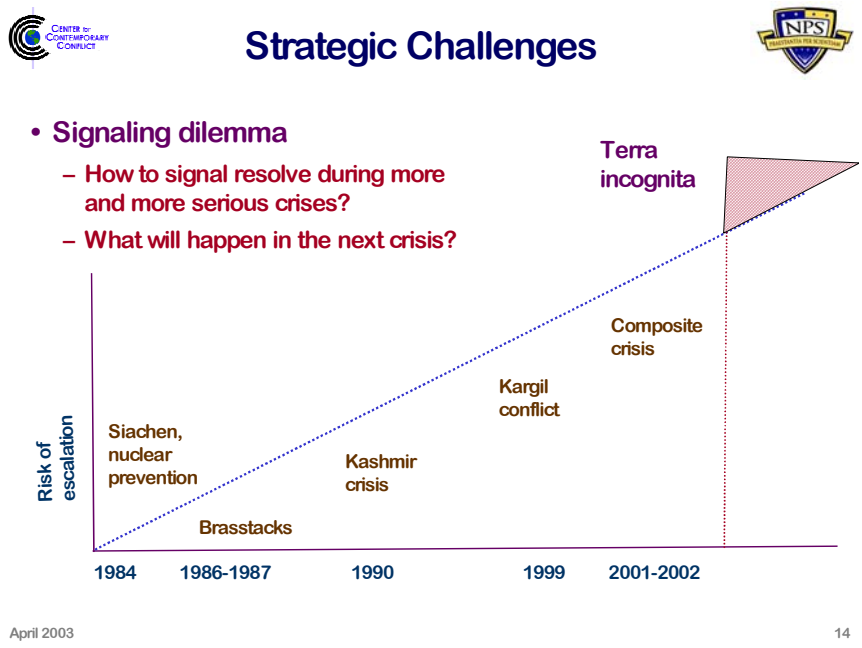
1. *Strategic* stability – The ensuring of safety, security, and survivability of strategic forces.
2. *Deterrence* stability – The mutually perceived resolve to use credible nuclear forces.
3. *Crisis* stability – When neither side believes it can launch effective preventive or pre-emptive attacks.

Gen. Khan continued the discussion, focusing on challenges to strategic stability and reliable deterrence in the region. He pointed out that both Pakistan and India are now in their fifth year after the first tests of their nuclear weapons, and both face some of the same problems and questions as during the Cold War, along with some new challenges.

Politically, he argued, there is a dangerous "balance of power" dilemma. There remains a deep-seated regional rivalry as part of a larger and more complex phenomenon of balancing the threat of Indian hegemony with Pakistani resistance to this trend. Out of this rivalry, a lack of confidence has developed into a slippery slope. In addition to the "balance of power" dilemma, another political challenge for Pakistan and India is the "independence-dependence" paradox, which addresses the reality that India and Pakistan assert independence in developing and possibly deploying strategic forces, but each also counts on American intervention to restrain the adversary and ensure stability.

There are also several major military challenges to resolving this regional stability problem. The first challenge is the "doctrinal asymmetry dilemma," which describes the geographic, conventional, and resource advantages that permit India's relaxed nuclear posture, and Pakistan's subsequent emphasis on conventional, sub-conventional, and nuclear first-use options. The second challenge is the "stability-instability" paradox, which addresses the notion that the nuclear balance might encourage limited military adventures, placing unacceptable risk of escalation on the other side. The third military challenge that Gen. Khan addressed is the "vulnerability-invulnerability" paradox, the crux of which implies that in order to reduce vulnerability to attack, strategic forces must be dispersed, raising vulnerability to sabotage and loss of control. The fourth and final military challenge is the "inadvertent escalation dilemma," which occurs when the outbreak of conventional war increases the risk of escalation as the "fog of war" sets in.

In terms of the challenges faced by the command and control systems, Gen. Khan identifies four main dilemmas. The first, the "always-never" dilemma, addresses the goal of command and control to ensure that nuclear weapons always work when directed and never work when not directed by the appropriate authority. The second challenge faced by command and control systems is the "overt-covert" dilemma. This dilemma addresses the risks of either approach to deployment, in that overt deployment risks preemption and diplomatic fallout, whereas covert deployment risks human and technical errors. In addition to the "overt-covert" dilemma, the lack of reliable technology increases reliance on humans, who are prone to environmental influences, errors, et cetera, which is referred to as the "human-



technology" dilemma. The fourth challenge to command and control systems is the "civilian control" dilemma. While India cannot figure out how to involve the military more effectively in the command and control of nuclear weapons, Pakistan cannot figure out how to involve civilians more effectively within the framework of their command and control systems.

Gen. Khan then discussed the strategic challenge of the "signaling dilemma" in the India-Pakistan stability dynamic. The main questions posed by this dilemma are "how to signal resolve during more and more serious crises?", and "what will happen in the next crisis?"

Gen. Khan concluded by identifying the final set of challenges regarding strategic stability in South Asia: the set of challenges to United States policy in the region. The first of the three main challenges is the "balance of interests dilemma," which asserts that US interests in the region are different, less intense, and more sporadic than those of local actors. This challenge serves to limit United States influence in the region. The second challenge to United States policy is the dilemma regarding "war prevention vs. nonproliferation." The dilemma addresses whether or not the United States should prevent nuclear states from going to war, or prevent war-prone states from going nuclear. The third challenge for U.S. policy is the "security assistance" dilemma. This dilemma recognizes that U.S. efforts to increase one country's security might increase the other side's insecurity. An example of this would be assisting one of the two rivals in implementing a missile defense system.

Discussion and Areas for Future Consideration

Regarding Dr. Geller's presentation on Power Cycle Theory, one participant inquired as to whether or not there are uncertainties about Power Cycle Theory as a predictive tool, based on the lack of informational indicators. Dr. Geller agreed that there is a quantitative lack of information, but maintained that the best predictive information available was used.

A participant observed that the capabilities assigned in Power Cycle Theory might not reflect levels of technology within those countries. Dr. Geller answered that Power Cycle Theory utilizes new types of indicators in its predictions, and that it maintains its relevance by including nuclear weapons in its measurements of relative power.

Another participant asked if Power Cycle Theory takes into account insurgencies and surrogate wars, and if so, is it still an equally predictive tool. Dr. Geller conceded that Power Cycle Theory has not addressed irregular, guerilla forces and conflicts.

Regarding Dr. Lavoy's and Gen. Khan's presentation, one participant observed that the stability issues discussed in this presentation were not unique to South Asia, but asked what the United States potentially could do to prevent more regional instability. Lavoy and Khan responded that conflict resolution would be the most effective approach. Thus, this process should be commenced *now*, rather than later in the escalation process. They

maintained that Washington does not have many options other than early diplomatic intervention.

In addition, the participants also wondered why nuclear signaling appears to be problematic in South Asia. Dr. Lavoy and Gen. Khan answered that the two sides simply lack an understanding of how to put nuclear signaling into practice. One example of their bungled nuclear signaling would be the crisis that emerged from the 1998 tests.

One participant brought up Keith Payne's point from his opening remarks that deterrence may not work because of different cultural values, and asked whether or not this is the case with India and Pakistan, and whether or not the result is that classic approaches are non-applicable to the situation. Gen. Khan answered that both sides know the ramifications of nuclear war, but in a cultural context, these risks are not valued as highly as in the West. He emphasized the inherent dismissal as well as the subsequent pressing of the limits of deterrence. Dr. Lavoy added that the United States figures prominently in every strategic interaction in the region and, therefore, certain measures are taken to antagonize the United States. This is reminiscent of the "dependence/independence" paradox. He also pointed out that in each crisis, Pakistan deterred conflict with India using conventional forces, which comprise 95% of Pakistan's deterrence threat. He concluded that nuclear weapons deter India from waging a "war of attrition."

Panel VI: Modeling and Predicting Strategic Stability

Introduction

The topic of the sixth panel of the 2003 Nuclear Stability Roundtable was Modeling and Predicting Strategic Stability. Mr. Larry Sanders of the Advanced Systems and Concepts Office of DTRA chaired this panel. The presenters of this panel:

- Mr. Karl Serafin and Mr. Guy Grundman, SPARTA, Inc.
  Strategic Offense, Defense, and Arms Control (SODAC)

- Dr. Sean O'Brien, Center for Army Analysis
  Near Term Forecasts of Crises and Instability Using Text-Based Events (NEAR-TERM FORECITE)

- Mr. Dennis Powell, Los Alamos National Laboratory
  Sex, Games, Values, and Rationality: Shortcomings of Strategic Stability Models

Background

The purpose of the Modeling and Predicting Strategic Stability panel was to address how to best utilize models to examine the parameters of strategic stability in a rapidly evolving security environment. In the first presentation of the panel, *Strategic Offense, Defense, and Arms Control (SODAC),* the SPARTA team demonstrated their model's utility for strategic analysis. Dr. O'Brien's presentation, *Near Term Forecasts of Crises and Instability Using Text-Based Events (NEAR-TERM FORECITE),* addressed the development of analytical techniques to assess states that are vulnerable to instability. Mr. Powell's presentation, *Sex, Games, Values, and Rationality: Shortcomings of Strategic Stability Models,* examined some of the problems associated with developing models for assessing strategic stability.

Key Insights

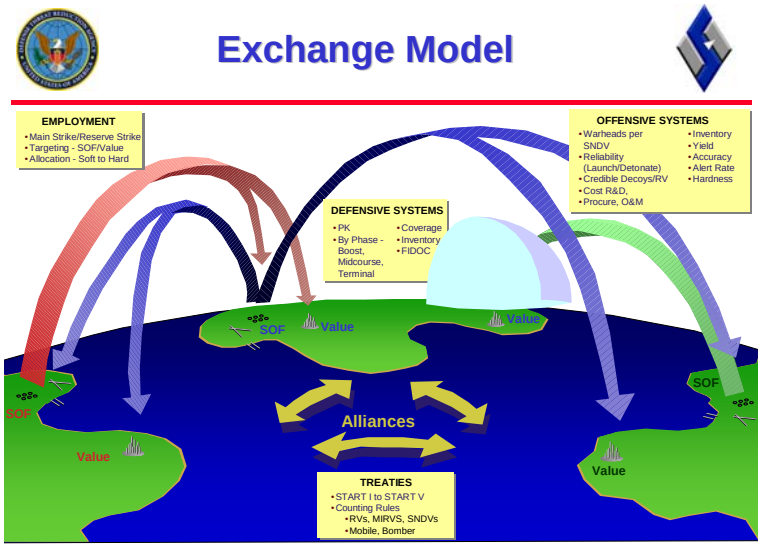
Mr. Serafin and Mr. Grundman presented the first modeling presentation of the panel: *Strategic Offense, Defense, and Arms Control (SODAC).* In describing the concept, scope and purpose of the SODAC model, Mr. Serafin argued that in terms of short-term and long-term projections, SODAC can: analyze multi-polar exchanges on many levels; address trade-offs among politicial, military, and economic factors; incorporate action and response of different players; and derive an end state.

SODAC is a computer model that attempts to optimize a country's strategic position in relation to other allies/competitors given a set of specified goals and constraints. The specifics that have been applied to the SODAC model have been the country's security situation, its force levels and types of available weapons systems, arms control agreements, alliances to determine who is aligned with/against whom, economic potential

based on country's GDP profile, foreign policy trends, and whether its military doctrine is primarily offensive, defensive, or deterrence-oriented.

The purpose of the SODAC model is to provide analysts and decision-makers a PC-based planning tool to explore strategic policy options and test hypotheses. In terms of the potential scope of the model, SODAC is especially useful because an analyst can assess three or more countries at a time.

Mr. Serafin described the "heart" of SODAC as the Exchange Model, which determines the weapons systems allocated. This begins as a static spreadsheet model, but becomes dynamic over time.



The SPARTA team then provided an example scenario in order to demonstrate the usability of the SODAC model. This example scenario was entitled the "Sino-U.S. Strategic Competition," in which China and the United States are engaged in a conflict where China is offense-oriented and the United States is defense oriented. During the preparation of the scenario, the model uses certain "criteria" to set up the relationships between the two countries on many different levels. Examples of the behavioral criteria involved are *posture*, *alliances*, and *arms control involvement*.

The SPARTA team then described how the SODAC model is run and how it produces a quick analysis of the results, where delineated graphs are thoroughly explained by the program. It was then stated that the output of data from the model is only the beginning of the potential for analysis. The initial results will inspire questions and follow-up runs of the model, providing a baseline for a more substantive analysis. Following the substantive conclusions, SODAC also allows for continuous analysis of follow-on results.

The SODAC model also allows for the expansion of the scenario to tripolar or multipolar interaction. For the "Sino-U.S. Strategic Competition" example, the question can be introduced of how Russia might influence the Sino-U.S. strategic interaction. Within the model, then, Russia may be incorporated as an active player and the model will explore alternate alliance relationships. In this example, Russia was put in alliance with China, against the United States.

In addition to this example scenario, SODAC offers other analytical applications:

- Trilateral balancing of regional issues (e.g., China – India – Pakistan)
- Complex, multilateral interaction (e.g., China - India – Pakistan – U.S.)
- Interaction between allies and adversaries (e.g., Russia – China vs. U.S.)
- Emergence of "rogue state" WMD power (e.g., China – U.S. – North Korea)
- Regional strategic balancing (e.g., India – China – Pakistan) in order to: modify/ develop database for India and Pakistan; design scenarios, construct profiles, and adjust model function; and select active players and run simulation.

Other analytical applications of SODAC include running a series of contained simulations as part of a larger integrated analysis, as well as using SODAC in conjunction with other analytical tools.

Dr. Sean O'Brien of the Center for Army Analysis then presented *Near Term Forecasts of Crises and Instability Using Text-Based Events (NEAR-TERM FORECITE)*. He described the project as the development of analytical techniques to assess states that are vulnerable to instability. One unique aspect of this type of modeling is that it is conducted in near real-time. This project culminated in six studies, the most recent of which was discussed in Dr. O'Brien's presentation.

The purpose of Near-Term Forecite is to develop, demonstrate, and apply a cohesive methodology to conduct short-term forecasts of country instability at the national and sub-national level. Near-Term Forecite is able to link countries' macro-structural trends at the national level, dynamic events, or "triggers" at the sub-national level, and decision-making attributes to more precisely elucidate the nature, evolution, and timing of crises. Another capability of the model is to collect and analyze political events data generated from English-language news reports (e.g., Reuters wire service). It will also permit near real-time identification, assessment, and monitoring of the seeds of crises. Historical cases of U.S. military, economic, and diplomatic interventions can be archived, as well, and leveraged to validate analyses and case studies derived from Near-Term Forecite. Finally, Near-Term Forecite can provide forecasting models that can be developed, maintained, and accessed on analysts' desktops.

Virtual Research Associates (VRA) has applied its IDEA (Integrated Data for Events Analysis) framework and frame parsing technology to Near-Term Forecite to code automatically events reported in news reports. The results of this coding have been very accurate across massive amounts of information. This framework can be applied to *any* English-language text with consistent style and grammar. Dr. O'Brien stated that Reuters was used because it has the broadest, most consistent coverage of basic events forms. IDEA can identify, code, and assimilate 8,000 events per hour (humans can do 5-10 events per hour).

An example of a codable event: Who did what to/with whom, when, and where?

- Who = source or initiating actor.
- What = IDEA event form (verb).

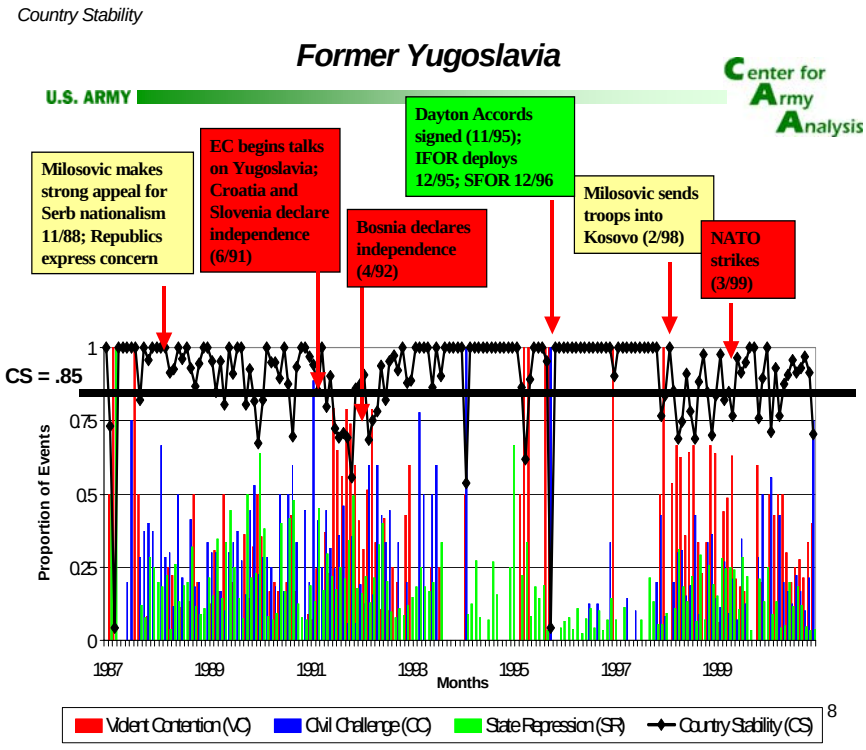
- To whom = target (recipient actor).
- When = report date.
- Where = report location (and possibly the target depending upon event form and context).

Dr. O'Brien then discussed "event forms" within the IDEA framework, and the 22 "cue" categories, which govern them. This broad range is intended to address the range of cooperation/interaction between individuals, states, and groups. Individuals, groups, and both state and non-state actors are tagged in the daily news monitoring. This tracking helps characterize the intensity of the stability climate.

For the preliminary set of methods and models, the purpose was to test and evaluate the climate based on the model, to visualize the data, and then determine if history matched the model's projections of stability. The first model-monitoring tool used was the Conflict Carrying Capacity or Country Stability model. Dr. O'Brien defines CCC/CS as the ability of the state to regulate intense internal conflict without loss of system integrity. This is derived from interactions between:

- Civil Contentiousness (CC) – Proportion of civil actions reported as contentious.
- State Repression (SR) – Proportion of state actions that are reported as extra-institutional.
- Violent Contention (VC) – Proportion of actions entailing physical damage to persons or property.

Dr. O'Brien illustrates Country Stability through the case of the former Yugoslavia. In this graph, the numerical representation of CS is .85. The index is on a scale of zero through one, where zero represents complete chaos and one represents solid stability. If at any point, CS of the country falls below .85 and remains there for three periods, it serves as early warning of instability. On this chart, it is clear that in periods where the CS was below .85, hostile periods followed. This historical example validated the Forecite methodology.



Stock market prediction techniques were also applied. These predictive techniques are meant to track trends in indicators of interest, in this case, overall levels of

violence, hostility, and cooperation in a country. These predictive tools would also provide early warning of changes in trend direction or momentum.

In his conclusion of the presentation, Dr. O'Brien conceded that this project has had a late start and that not as much progress has been made as would have been desirable. He added that Near-Term Forecite would eventually be widely accessible via the World Wide Web. The focus of the model will be on the top 40 countries expected to experience instability through the year 2015. In focusing on these countries, the objectives will include: point-and-click access to long- and short-term trends on hundreds of indicators, country-specific monitoring and forecasting models, and the capability to drill down to individual data points (i.e., daily Reuters reports).

In his presentation, *Sex, Games, Values, and Rationality: Shortcomings of Strategic Stability Models*, Mr. Powell addressed some of the problems associated with developing models for assessing strategic stability. He argued that the first question that should be asked is "what are we are modeling?" Strategic stability, in turn, should be characterized by:

- The set of conditions that give highest probability that essential system characteristics are unchanged.
- The lowest possible probability of nuclear warfare.
- A predictable environment (confidence in predictability).
- Specialized definitions.
- Acceptable pace of change.

Mr. Powell asserted that current stability models are non-predictive and inaccurate. He argued that an inherent problem with modeling is that we can only model what we can measure, such as: forces (offensive systems with missiles, warheads, and platforms, and defensive systems with missile interceptors); targets (allocations of counter-force and counter-value); and effects (such as expected "cost"). From modeling, therefore, only a partial answer can be given because only a partial problem has been modeled. Thus, one can have good precision with model-based approaches to problems, but not necessarily good accuracy.

Mr. Powell explained that the underlying element of modeling is game theory, which has a set of rules, payoffs, and an action space. He argued that there are certain pro's and con's of using game theory for stability modeling:

- Pro's:
  - Theoretically rigorous approach to modeling decision-making.
- Con's:
  - Requires action space known to all (in advance).
  - All possible outcomes are known.
  - Payoffs are deterministic and known in advance.
  - Does not model human decision making well (complex factors).

When modeling decisions of a national leadership, game theory has lacked predictive power, as it fails to incorporate the human nuances that lead to irrational decisions.

Mr. Powell next addressed the role of rationality in decision making and modeling. He defined rationality as the process in which the decision-maker consistently makes choices in pursuit of his own objectives. He argued that rational people maximize expected utility, expressed in terms of Subjective Expected Utility (S.E.U.). This notion evolved from the idea that rational people will maximize the expected payoff. Rational decisions, however, will not always lead to desirable outcomes. In relating these concepts to strategic stability, Mr. Powell maintained that there are infinite possible outcomes for a strategic stability game, with *no* desirable outcomes. In addition, individuals and social decision-making groups are often patently and systemically irrational, with humans tending to make decisions based on arguments and justifications, rather than calculations of utility.

In terms of assessing values in modeling strategic stability using game theory, Mr. Powell stated that decisions related to strategic stability involve perception of thought and risk. Drivers for engaging in warfare, therefore, are characterized as political, economic, cultural, and religious. Cultural tendencies, in this context, tend to be equated with values. Worldviews are social, cultural, and political attitudes that seem to influence people's judgements about complex issues. These worldviews are strongly correlated with perception of risk.

World View	Descriptive Statement
Fatalism	"I feel I have very little control over risks to my health."
Hierarchy	"Decisions about health risks should be left to the experts."
Egalitarianism	"If people were treated more equally, we would have fewer problems."
Individualism	"In a fair system, people with more ability should earn more."
Technology Enthusiast	"A high technology society is important for improving our health and social well-being."

In addition to values, sex also plays a role in modeling. Mr. Powell argued that sex affects risk perception and thus decision making. He continued that women, for example, perceive risk higher than white males.

Mr. Powell next identified the requirements for building better stability models:

- Represent coercive *and* cooperative actions, which expand to achieve stability via many international avenues.
- Represent states in good confidence regarding traditional goals, resources, values, perception of threat, as well as risk tolerance of the leadership.
- Represent state-state interactions, including economic trade, diplomacy, and communications.
- The involvement of international organizations, representing a basis for cooperative problem-solving.
- Ability to demonstrate stability, *then* instability, demonstrating causal structure that could lead to instability.

Discussion and Areas for Future Consideration

Regarding SPARTA's presentation of the SODAC model, one participant inquired as to whether or not the worst-case scenario was taken into account during simulations. The presenters responded by stating that the worst-case scenario was incorporated into a larger analysis, and that it may become publicly and internationally available.

With respect to Dr. O'Brien's presentation on Near-Term Forecite, a participant asked whether sources could be assigned weight of biases in analysis. Dr. O'Brien responded that because Reuters is the source examined, there are limited biases because only a basic telling of events is involved. The model, therefore, is not searching for nuances, but rather is processing the content of massive amounts of information.

Another participant addressed the issue of trends and correlations in Reuters reporting, and posited that, perhaps, the statistical results should be counterbalanced for better reliability. Dr. O'Brien replied that because of the limited biases in Reuters reporting, the emphasis of the results will likely be reliable.

Some participants also wondered about the reliability of applying stock predictive techniques to this type of stability model. Dr. O'Brien maintained that they are reliable and useful techniques.

One participant pointed out the problem of dealing with "noisy" data and trying to make predictions based on that "noise." Dr. O'Brien responded that the model is not attempting to make point predictions, but rather forecast long-term trends.

Regarding Mr. Powell's presentation, a participant observed that no game-theoretical or any other type of model would ever be perfect. Mr. Powell agreed and added that game theory will probably not significantly help with low-probability, high-consequence games.

Another participant questioned why accuracy is so important in trying to simplify and predict when using models. Mr. Powell answered that predictive accuracy is important, and that model-makers tend to be mostly concerned with validation of their models.

Panel VII: Novel Approaches to Modeling Stability

The seventh panel of presentations addressed the topic of Novel Approaches to Modeling Stability. Mr. Dennis Powell of the Los Alamos National Laboratory (LANL) was the facilitator. The presenters of Panel VII were:

- Dr. Edward MacKerrow, Los Alamos National Laboratory
  Agent-Based Simulation of the Socio-Economic, Cultural, and Political Factors Which Motivate Islamic Terrorism

- Mr. Bruce Colletti and Mr. Frank Wolfe, SAIC
  Greek Fire and Cliometrics: Extreme Weapons and the Mathematics of History

Background

The objective of the Novel Approaches to Modeling Stability panel was to explore innovative ways of addressing strategic problems. Dr. MacKerrow's presentation, *Agent-Based Simulation of the Socio-Economic, Cultural, and Political Factors Which Motivate Islamic Terrorism,* addressed the potential of using an agent-based model to better gauge and predict Islamic terrorist activity against the United States. Mr. Colletti's and Mr. Wolfe's presentation, *Greek Fire and Cliometrics: Extreme Weapons and the Mathematics of History,* discussed their framework for the development of a cliometric tool to provide analysts with appropriate historical analogies.

Key Insights

In his presentation, Dr. Edward MacKerrow discussed LANL's work on *Agent-Based Simulation of the Socio-Economic, Cultural, and Political Factors Which Motivate Islamic Terrorism.* This project involved a large, multi-faceted team to achieve the following goals of the Threat Anticipation Project (TAP) agent-based framework:

- Determine sound metrics of socio-economic instability for non-Western cultures and religions.
- Develop a usable and flexible framework for policy analysts, intelligence analysts, and the military.
- Develop the ability to assess which data is most important.
- Generate scenarios.

Dr. MacKerrow then argued that both induction (discovery of patterns in empirical data) and deduction (specification of sets of axioms and proven consequences that derive from assumptions) are essential components of a paradigm of agent-based modeling. He continued that an agent-based model should ideally start with an explicit assumption, generate scenarios, and allow plausibility analysis. Agent-based models can be usefully applied to a variety of disciplines, such as:

- Economics (markets; macro/micro; technology; norms)
- Politics

- Sociology
- Computational Organizational Theory

In the context of this specific project, Dr. MacKerrow posited that scenario generation should be contrasted with probabilistic estimates of information. An example of this would be charting scenario frequency versus the number of attacks by Islamic terrorists in a five-year period. Thus, the model should provide an effective simulated distribution. One fundamental problem, however, with this theoretical approach is that the comparison would be difficult to calibrate. In order to make this effective, therefore, the application of this type of scenario generation should be reviewed by experts for plausibility, as well as level of insight gained by each scenario.

The main focus of this project, as Dr. MacKerrow discussed, was to look at terrorism from the perspective of the terrorist. One key feature of succeeding in this venture is to realize that every group has a set of utility functions, and in Islam there is a different utility set. On the organizational level of terrorism, there is also the "supply and demand" view, which addresses the notion that there is an endless stream of individuals to supply the demands of the organization (suicide bombings, financing, etc.).

Dr. MacKerrow then turned the discussion toward roots of terrorism. He stated that terrorism usually results from multiple causal factors. These are implicit factors and conditions that motivate an individual to take action. In the project's model, the input data is based upon empirical distributions, which address the initial conditions of the individual terrorist in the Middle East, including specific attributes and goals.

Another set of input data involved in this model is how others view the United States. The sources used for measuring these opinions (e.g., other countries' perception regarding U.S. arrogance) are the pre- and post-9/11 Gallup Polls, which surveyed 10,000-30,000 individuals in the Middle East.

Utilizing this massive amount of information, agents interact on social network topologies. Some of the attributes addressed in these social networks are:

- Kinship
- Friendship
- Hierarchy
- Organization of social networks

Dr. MacKerrow continued by stating that agents change, and subsequently so do their interactions. The agent's evolution, therefore, affects the model.

Another dynamic of modeling based upon the behavior of individuals in these specific networks is the idea of "social wealth." Dr. MacKerrow argued that "social wealth" is based on different factors, depending on region. This level of influence may or may not be based upon material wealth and/or religious influence. One important aspect of this is the notion of allegiance and loyalty, in relation to the traditional concept of the "social contract". Perfectly correlated with the level of "social wealth" one has obtained, is the

estimation of the individual's social disadvantage. This combination leads to social grievance, which is one metric of instability in this model. This "social grievance", Dr. MacKerrow argued, tends to be expressed via backlash against a different cultural regime (e.g., the United States), as the social disadvantage is equated with cultural oppression. Thus, in order to improve this model, it is necessary to learn more of whom it is reflective in the Islamic world.

Dr. MacKerrow concluded by stating that this agent-based model is in its second phase, with the current focus devoted to sub-national and regional issues. He pointed out that for each regional and social model, the specific attributes would change. The model, therefore, can be best understood as a tool to describe social networks and the relative social disadvantage that subsequently leads to social grievance and individuals inclined to participate in terrorism.

In their presentation, *Greek Fire and Cliometrics: Extreme Weapons and the Mathematics of History*, Mr. Bruce Colletti and Mr. Frank Wolfe of SAIC discussed their framework for analysis of the development of a cliometric tool for analysts. Mr. Wolfe briefly defined cliometrics as the use of appropriate historical analogies by decision-makers.

Mr. Wolfe opened the presentation by addressing the question: why use historical analogies? He stated that historical analogies are valuable fundamentally because we are not operating in a vacuum. He continued that decisions, which enhance peace, security, and national interest, must be historically well informed. Mr. Wolfe emphasized this point with a quotation from George Santayana, who stated that "those who cannot remember the past are condemned to repeat it," while adding his own spin that those who cannot remember the past are also condemned for forgetting it.

Every decision-maker uses historical analogies, either consciously or subconsciously, according to Richard Neustadt and Ernest May, in *Thinking in Time* (1988). Mr. Wolfe then argued that the use of a cliometric tool addresses the need of the decision-maker to consciously know more/some/all appropriate historical analogies, along with his own assumptions, in making a decision on a given issue.

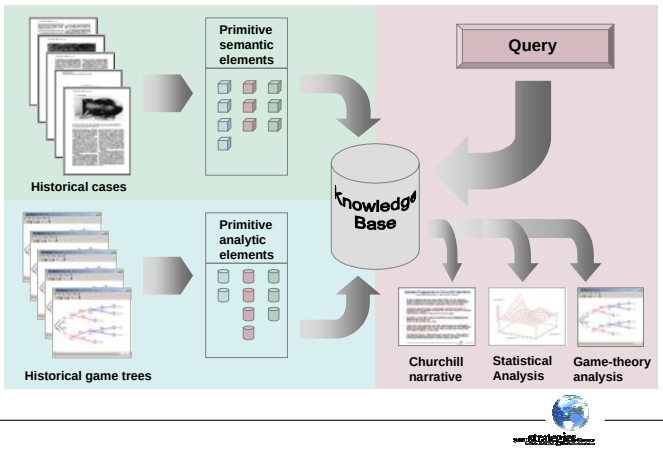
Mr. Wolfe described the goal of the project as informing and improving decision-making through more explicit development and use of historical perspectives. The "cliometric tool" provides brief historical narratives for decision-makers and analysts to use in crisis and deliberative planning. Knowledge bases can fuel game-theoretic models that assess diverse socio-economic and political/military scenarios. Thus, in comparing old and new crises, it becomes possible to test similarities and differences in decision-making.

This cliometric tool would be useful in crisis management by world leaders. Mr. Wolfe points out the possible comparable situations between Winston Churchill during World War II and George W. Bush today. While Churchill faced the Battle of Britain, Bush faced 9/11 and the Global War on Terrorism. Mr. Wolfe then described the precedent of the daily Churchill narratives, which were mandated one-page summaries of the day's events. Following 11 September and echoing Churchill, Condoleeza Rice wrote a one-

page summary of the first stage of the war plan on 16 September for a National Security Council meeting the next day.

The cliometric tool scans a knowledge-base for historical analogies related to the crisis at hand. The chief output is a one-page "Churchill Narrative" of short paragraphs that describe analogies (information only; user forms opinions), with no recommendations.

Cliometric Tool Framework



In terms of a sample of tool inputs, an "issue" is entered into the model. For example, "What is the effect of using new weapons and new doctrine?" This "issue" provides different exploratory directions for the model because of the variety of meanings conveyed by the same vocabulary. The time periods, for example, could be grouped by date or name (e.g., Era of Muscle, Era of Gunpowder, Cold War, Napoleonic, Reconstruction). In addition, the cultural perspective is also involved, such as "Islamic", "South Asian", "East Asian", "Western." The cultural bias helps to notionally balance and reduce the range of input.

The design and use of the cliometric knowledge-base was then discussed. The knowledge-base consists of data structured as Prolog terms. Each term carries a narrative fragment with attributes (identified by diverse factors). Backward-chaining finds circumstances that create a stated condition (Prolog is the search engine). Forward-chaining finds consequences of a stated condition. Various predicates (i.e., rules) parse user input, represent it semantically, generate synonyms, guide the search, and use the semantic representation to cull and match terms that satisfy the query. Similarity is judged via Levinstein metrics, syntactic pattern matching, graph-theoretic distances, group-theoretic metrics within a permutation group, associative algebras of word use, etc.

Mr. Colletti also argued for the effective application of the cliometric knowledge-base to feed a game-theoretic model. For this to occur, the scenario query must include the following game-theoretic details, in order to construct an appropriate structure for desired output: actors, possible courses of action, desired objectives and accompanying utility functions. In addition, a provisional game tree is built to represent the query scenario. The knowledge-base is queried for similar game-theoretic scenarios, which can be structured for Prolog or other taxonomies, such as M.I.T.'s CASCON. The analysis of historical game trees and historical outcomes provides insight into: likely outcomes for query scenario; surprising outcomes for similar or slightly different scenarios; refining the choices; and, objectives and utilities of the query scenario game tree. Mr. Colletti re-

emphasized that the goal would not be to provide recommendations, but rather to provide information.

Discussion and Areas for Future Consideration

Regarding Dr. MacKerrow's presentation, one participant asked how the agent-based model would distinguish between leaders of groups and the followers. Dr. MacKerrow answered that certain attributes of leadership potential would be assigned to individuals.

Another participant inquired as to whether it would be possible to use the model to predict inclinations of populations in the fostering of terror groups. Dr. MacKerrow responded that this may eventually be possible, and that it is already addressed partially by allegiance vectors and grievance factors (as applied from the Gallup data).

One participant raised the question of whether the model has the potential for offering insight into relative merits of diplomatic approaches to terror groups. Dr. MacKerrow stated that while certain groups, such as al Qaeda, seem to be non-negotiable, we may be able to negotiate with others. The model suggests that it may be possible to mathematically delineate these factors.

With respect to Mr. Wolfe's and Mr. Colletti's presentation, one participant inquired if the team had researched and found any similar tools. Mr. Wolfe and Mr. Colletti responded that prior to embarking upon this project, extensive research had been done regarding similar approaches to historical analogies, but nothing resembling this concept was found.

Another participant pointed out the problem of "non-events" in history. The presenters responded that because this is still a conceptual effort, how to deal with such interpretive issues has not yet been addressed.

Session VIII: Enhancing Deterrence Stability

Introduction

Dr. Tom McIlvain of the U.S. Department of State introduced the panel entitled *Enhancing Deterrence Stability*. The panelists for this session included:

- Dr. Kerry Kartchner, U.S. Department of State
  Crossing the Nuclear Threshold: The New Dynamics of Escalation

- Dr. Greg Canavan, Los Alamos National Laboratory
  Impact of External Costs on Theater WMD Logic

Background

This panel's goal was to evaluate tools that might assess how to enhance deterrence stability. Dr. Kartchner's presentation discussed the definitions and assumptions associated with the "nuclear threshold." Dr. Canavan's presentation extended game theoretic analysis to determine optimal decisions in theater engagements.

Key Insights

Dr. Kartchner's presentation offered structured thinking about the "nuclear threshold." He began by discussing one of the pillars of strategic stability, the "presumption of non-use" of nuclear weapons. He then described various considerations and conditions that may raise or lower the nuclear threshold. Finally, he discussed terrorism, rogue states, and the new dynamics of escalation.

To begin, Dr. Kartchner argued that the presumption of non-use of nuclear weapons is a key feature of modern strategic stability. However, current conditions could warrant further thinking on this assumption. For example, multiple threats to the presumption of non-use exist, such as:

- Asymmetric efforts to counter U.S. conventional supremacy;
- Nuclear weapons and WMD may be seen by some as weapons of choice versus weapons of last resort (e.g., extremist groups fulfilling a perceived religious duty by attempting to acquire WMD);
- Inadequacy of traditional retaliatory deterrence;
- WMD use could occur at any point before, during, or after the commencement of conventional hostilities.

Despite this range of challenges to the presumption of non-use, Dr. Kartchner's presentation focused on the use of nuclear weapons. Within this context, he argued that policymakers must consider what nuclear use would mean in terms of:

- Crisis management;
- Combat operations;
- Escalation control under new conditions; and

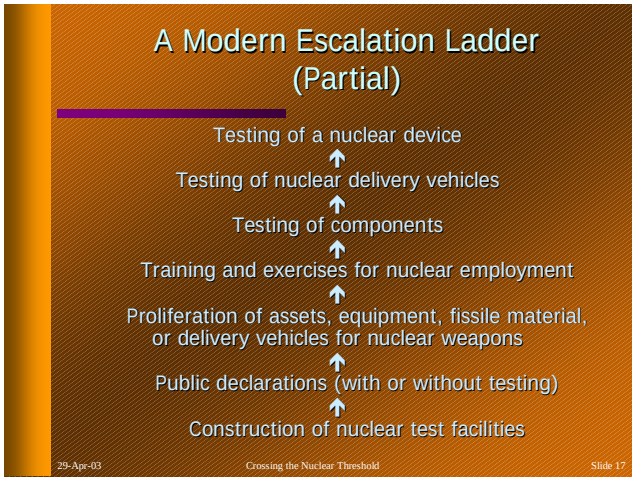
- Requirements of post-use deterrence and stability.

The dynamics of escalation to nuclear use, or "crossing the nuclear threshold," are likely to be very different today that they were during the Cold War. Participants were encouraged to consider what it would mean if nuclear weapons were actually used.

Dr. Kartchner defined the "nuclear threshold" in two ways. First, he provided the "traditional meaning." This definition perceives the nuclear threshold to be one rung in the ladder of the escalation process. He used Herman Khan's definition, which is "the actual use of nuclear weapons in the course of a process of escalation." Dr. Kartchner also provided the increasingly common usage of the phrase "nuclear threshold," as "the decision to acquire, or actually acquiring nuclear weapons to use as a tool for coercion and intimidation, or the decision to test nuclear devices." He suggested that "breakout" might be a better term for the latter of the two definitions.

Policy decisions can raise or lower the nuclear threshold, that is, decrease or increase the likelihood that nuclear weapons will be used. For example, a decision to improve the operational flexibility of nuclear weapons could potentially lower the nuclear threshold. Alternately, complicated nuclear release procedures or the availability of conventional precision-guided weapons could raise the nuclear threshold. Dr. Kartchner further argued that raising the nuclear threshold might diminish deterrence, while lowering the nuclear threshold may increase the credibility of a deterrent threat.

Several reasons were presented as to why a rogue state may decide to cross the nuclear threshold: to warn, demonstrate resolve, and preclude or dissolve U.S. or allied intervention. Similarly, rogues may cross the threshold in order to deny access to ports, facilities, supply routes or natural resources. Internally, the acquisition of nuclear weapons may legitimize investment of resources in nuclear weapons R&D or demonstrate a leader's resolve to stand up to Washington.



Dr. Kartchner then presented a modern escalation ladder and considered it in the context of current challenges. One scenario that might prompt the crossing of the nuclear threshold would be nuclear retaliation for a chemical or biological attack. Dr. Kartchner concluded, however, that the benefits of using nuclear weapons in retaliation for chemical or biological attacks are unlikely to outweigh the costs of crossing the nuclear threshold. He also cited the recent case of Operation Iraqi Freedom, and argued that the classic Cold War conditions for the escalation to nuclear weapons were present in the final days of the conflict. However, WMD weapons were

not used in Iraq. Dr. Kartcher suggested a few options for this outcome, including coalition efforts to suppress WMD use.

Dr. Kartchner concluded his presentation by encouraging Roundtable participants to further how best to:

- Validate the definition of what "raises" or "lowers" the nuclear threshold;
- Explore the non-proliferation implications of raising or lowering the nuclear threshold; and
- Examine the feasibility of a strategy for manipulating the nuclear threshold as deterrence requirements fluctuate.

Dr. Canavan, of LANL, presented the *Impact of External Costs on Theater WMD Logic.* Dr. Canavan extended game-theoretic analyses to determine optimal decisions in theater engagements involving WMD. According to Dr. Canavan, the ultimate decision to use WMD is based upon costs and benefits. The decisions leading up to the final decision on whether to use WMD, however, were complicated by assessment of the costs external costs of WMD use. In his presentation, Dr. Canavan pointed out two key parameters within the game-theoretic analysis:

1. Net benefit of the use of WMD by the stronger side; and
2. Cost to the weaker side of terminating conflict after using WMD versus the cost of terminating a conflict without using WMD.

Dr. Canavan described the impact of external costs on decisions to use WMD. For example, early in the decision-making process, considerations about collateral damage influenced a decision about whether or not to use WMD.

The difference between strategic engagements and theater engagements was highlighted. In a strategic engagement, all sides have a common interest in avoiding conflict altogether. Dr. Canavan argued that in a theater engagement, the decision to engage has been determined by larger political factors, and, therefore, each side's goal is to achieve the best possible outcome for itself with the forces at its disposal. Thus, instead of minimizing potential costs, which is the usual metric for strategic engagements, the competitors seek to maximize their likely real, net benefit. This net benefit is the military benefit of a decision to use WMD minus the political and other external costs of taking such action.

Dr. Canavan used a decision tree to demonstrate the game-theoretic analysis and explore the decision logic. In the decision tree, U represents the United States and P represents the proliferator.

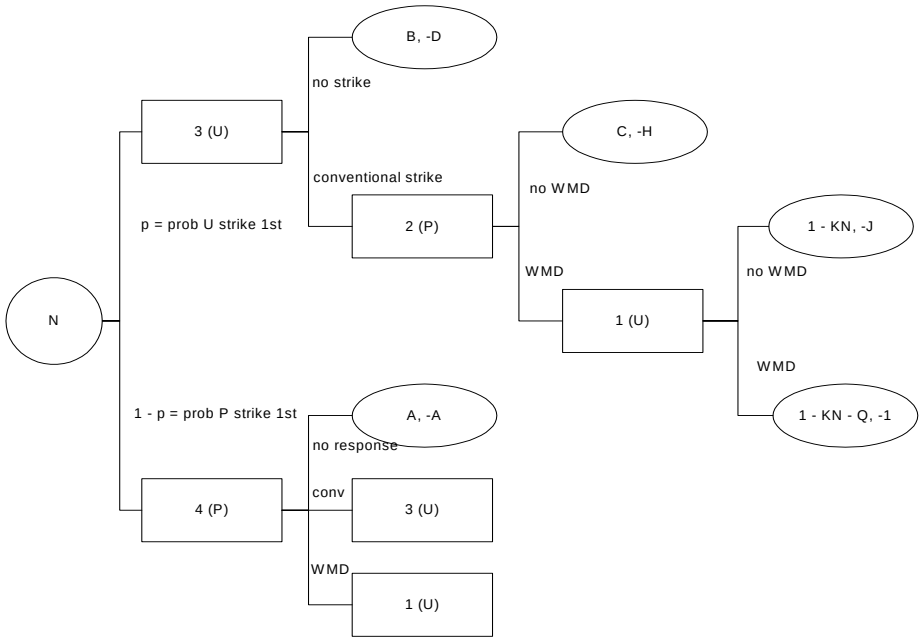


Table. 1. Decision tree for theater use of WMD

The above figure analyzes the optimal steps in decisions whether to use WMD in theater engagements. Slightly different from the formalism of strategic engagements, theater logic involves a more varied set of costs and, therefore, requires a more complex structure that can evaluate multi-step sequential interactions. Within the parameters mentioned previously, the stronger side's ultimate decision is based on the net effectiveness of WMD use.

Conversely, the weaker side's prior decision to use WMD is based on its estimate of whether the stronger side would retaliate in kind at a later stage. In addition, the weaker side also considers the cost of terminating the conflict after having used WMD relative to that of terminating without using WMD. If the stronger side determines that WMD will be effective, that realization deters WMD use by the weaker side at each stage in the decision making sequence – not on the threat of retaliation, but on the basis of the military effectiveness they are assumed to have in conflict termination. If the stronger side does not find WMD effective, their possession does not deter its use by the weaker, which will use WMD if it estimates that the cost of terminating the conflict after having used WMD is no greater than that of terminating conflict without having used it.

Dr. Canavan argued that in strategic interactions, bluffing could be highly dangerous. On the theater level, however, bluffing can potentially be beneficial. The benefit is obtained if you can convince the opponent you have the means to retaliate with WMD and negate any benefit they would derive from an attack with WMD. Through bluffing, the player

can jump onto a sub-tree of the decision-logic framework, whereby the player is in a position to make all of the decisions.

Discussion and Areas of Future Consideration

Dr. Kartchner's presentation prompted discussion about nuclear retaliation. In particular, if Iraq had used chemical weapons and the United States did not retaliate with nuclear weapons, would the credibility of the U.S. deterrent be undermined? Similarly, participants discussed the massive casualties that would likely be associated with a CBW attack, and suggested that a large number of casualties in a short time frame might pressure U.S. leaders to cross the nuclear threshold.

An important distinction highlighted throughout the discussion was that two issues exist with respect to the nuclear threshold: nuclear use by the United States and nuclear use against the United States. These two scenarios will differ in their meaning and implications.

Another participant suggested that ballistic missile defense (BMD) could potentially lower the nuclear threshold. For example, if BMD was completely effective and opponents realized the futility of augmenting their missile program, they may instead divert funds allocated to missile development towards the acquisition of a nuclear capability.

It was further noted that many nations have recognized the political utility of proliferation, in that there is an inherent leverage or coercive value in a country's possession of nuclear weapons. The coercive value of nuclear weapons is perhaps a greater incentive than their deterrent value.

The discussion also touched upon the issue of escalation dominance. The United States exercised escalation dominance in Iraq. However, escalation dominance may have some negative aspects when applied to the case of India and Pakistan. Escalation dominance could potentially be a mechanism for raising or lowering the nuclear threshold.

Dr. Canavan's arguments regarding the efficacy of bluffing drew considerable participant interest. They questioned Dr. Canavan's assertion that it does not matter at "node 2" (see diagram, above) if a country's weapons have net effectiveness or not. Participants also discussed the value of "joint knowledge" within game-theory analyses.

Key Themes and Areas of Future Consideration

Stability Still the Organizing Principle?

In the end, the 5th Nuclear Stability Roundtable raised a number of questions about the concept of stability and its continuing role as an organizing principle, both in strategic affairs generally and in the Roundtable specifically. The various presentations made over the course of the conference highlighted the malleability of the term "stability." For example, there was general agreement that "strategic stability" meant the non-use of nuclear weapons. However, in one presentation, strategic stability also encompassed broader "predictability" in the international environment as well as an "acceptable" rate of change. In another presentation, strategic stability was defined as ensuring the safety and security of strategic (i.e., nuclear) forces. A related term, deterrence stability, was introduced as the "mutually perceived resolve to use credible nuclear forces."

The term "stability" was subject to an even wider variety of interpretations and applications. In one case, stability meant the absence of the outbreak of major armed conflict. In another, stability meant the absence of crises short of war (i.e., political, economic upheavals). One presentation saw stability as the derivative of a combination of military, regional political, economic, domestic political, environmental, cultural, and demographic factors. A presentation on terrorism identified "social grievance" as a predictor of instability.

There appear to be certain advantages and disadvantages in the definitional "softness" of stability. Because it is able to accommodate a wide variety of issue areas and analytical disciplines – from traditional nuclear exchange modeling, to regional security and terrorist threat anticipation – the inherent flexibility of stability would appear to be a strength. Nonetheless, there are risks that the concept can be overextended, that is, the connection between an analytical approach and "stability" could be so tenuous as to deprive stability of any real meaning. The risk of over-extension needs to be balanced against the risk that stability's Cold War lineage could inhibit new thinking about approaches to international security. While the need for some Cold War-type nuclear force exchange modeling is likely to endure as long as there are nuclear weapons, the real work on modeling seems to be how, for example, conventional and non-conventional (e.g., special forces, cyber attack) forces are to be integrated with legacy nuclear forces in the New Triad.

Broader questions can be raised as to whether stability, however defined, is seen as a universal good. Terrorism, for example, seems to fundamentally reject the stability paradigm. Other trends, such as WMD proliferation and decreasing U.S. confidence in deterrence, suggest that even the premise of strategic stability – the non-use of nuclear weapons – could be directly put to the test in the near-future. Indeed, it can be argued that stability is inconsistent with the inherent uncertainties of a multi-polar world. All of this suggests that there are risks in staking one's security on achieving stability. In some cases, stability could prove simply unobtainable. In other cases, fixation on stability could intellectually preclude investigation of alternative concepts of security more in tune with global uncertainty. Accordingly, a priority task for the next Stability Roundtable would be to address this issue head on by more critically assessing the utility of stability

as an organizing principle of international security, considering alternative approaches, and suggesting modeling and other analytical techniques to test resulting hypotheses.

Other Challenges to Stability

Over the course of the Roundtable participants identified a range of potential challenges that policymakers must address.

The Limits of Deterrence
Dr. Payne kicked off the Roundtable by encouraging participants to consider the limits of traditional deterrence theory in the face of current and emerging threats. Traditional U.S. concepts of deterrence were based upon the assumption that other leaders would be deterred by threats to their population, economy or themselves. In today's turbulent world, the idiosyncrasies that drive other leaders' decisions are not necessarily accounted for in current deterrence constructs.

U.S. Power
What processes and institutions can the United States enlist in order to legitimize its preventive military actions? The diplomatic crisis preceding Operation Iraqi Freedom will likely have long-term implications for stability, and will require a concerted U.S. effort to rehabilitate the "habits of cooperation" with friends and allies.

Proliferation
Roundtable participants were concerned about ways in which the WMD threshold might be crossed. Similarly, the possibility that terrorists might sabotage nuclear C2 systems was raised as a new concern that could undermine stability. Participants acknowledged that the success of Operation Iraqi Freedom as a preventive war would impact other proliferators but it was too soon to tell how. Participants also debated new approaches to compliance and other ways to approach rogue states in order to prevent proliferation.

How Can Traditional and Novel Approaches to Modeling Help Us Address Stability Challenges?

In addressing future stability challenges, the successful integration of both traditional and novel approaches to modeling may prove to be a key contributor to the U.S. intelligence and policy planning communities. Although there have been demonstrated limitations to many traditional stability models, including those based on game theory, the focus should be on developing work-arounds or entirely novel approaches. Some of these suggested model adaptations include more explicit modeling of multi-polarity, incorporating opponents' decision-making sphere(s) into the system, and operating models on multiple levels simultaneously. Another critical feature of modeling that needs greater attention is the "packaging" of results in a manner that would be most readily absorbed by policymakers.

Planning and Considerations for Next Year

Regarding the planning of and considerations for the 2004 Strategic Stability Roundtable, the articulation of problems that require analysis by decision makers was emphasized.

Additionally, the inclusion of selected foreign analysts would benefit the discussion by providing an added global perspective. Suggestions were made for potential topics for the 2004 Roundtable, such as: why Iraq did not use chemical or biological weapons during Operation Iraqi Freedom; what lessons were gathered by rogue states during the Iraq war; the potential security tradeoffs in sharing missile defense; and the role of information operations in international security.

Agenda

Fifth Nuclear Stability Roundtable
April 28-29, 2003

Agenda

Day One: Monday, April 28, 2003

8:00-8:30 Check-in

8:30-8:45 ***Welcome and Opening Remarks***

Mr. Richard Gullickson, Director, Advanced Systems and Concepts Office
Defense Threat Reduction Agency

Mr. Thomas Yehl, Acting Division Director, Verification Compliance for Technology and Assessment Division, Department of State

Dr. Lewis Dunn, Conference Chair
Senior Vice President, Science Applications International Corporation (SAIC)

8:45-9:15 ***Keynote Address***

Dr. Keith Payne, Deputy Assistant Secretary for Forces Policy
Office of Secretary of Defense

Session 1: Preemption and Stability - Chair: Mr. Larry Sanders

9:15-9:45 *Preemption, Legitimacy and Stability: Some Organizing Principles*
Dr. Michael Wheeler, SAIC

9:45-10:15 *Missile Defense as an Alternative to Preemption or Retaliation*
Dr. Kerry Kartchner, US Department of State

10:15-10:30 Break

Session 2: Regional Challenges - Chair: Dr. Jeffrey Milstein

10:30-11:00 *Stability Model of Northeast Asia*
Ms. Kristi Branch, Pacific Northwest National Laboratory

11:00-11:30 *East Asian Stability Challenges*
Mr. Peter Wilson, RAND

11:30-12:30 Lunch

Session 3: Nuclear Posture Review - Chair: Mr. Pat McKenna

12:30-1:00 *Unintended Consequences of Strategic Adaptability*
Mr. Guy Grundman and Dr. Michael Simon, SPARTA

1:00-1:30 *Protection from Sabotage Through Modeling*
Mr. Valery Yarynich, Visiting Scholar, UC San Bernadino

1:30-2:00 *Alliance Relations and Concepts of Assurance, Deterrence, and Dissuasion*
Professor David Yost, US Naval Postgraduate School

2:00-2:30 Break - *End of unclassified portion of Day One.*

Fifth Nuclear Stability Roundtable
April 28-29, 2003

Agenda

Day One: Monday, April 28, 2003 (cont'd)

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The classified portion of the roundtable begins here

2:30-3:30 ***The Nuclear Posture Review: Implementation***
Mr. Bernie Victory, Deputy Director Strategy Forces and Operations
Office of Secretary of Defense

***Session 4: Classified Presentations* - Chair: Dr. Jeffrey Milstein**

3:30-4:00 *A Game Theoretic Exploration of Escalation in a Taiwan Crisis*
Dr. Victor Utgoff, Institute for Defense Analyses

4:00-4:30 *India-Pakistan Nuclear Stability During Conventional Warfare*
Dr. Jerome Bracken, US Department of State

4:30-5:00 *Non-Strategic Nuclear Weapons*
Mr. Dunbar Lockwood, US Department of State

5:00 Adjourn

Fifth Nuclear Stability Roundtable
April 28-29, 2003

Agenda

Day Two: Tuesday, April 29, 2003

8:00-8:30 Check-in

8:30-8:45 ***Summary of Unclassified Discussion from Day One***
Dr. Lewis Dunn, SAIC

Session 5: Emerging Strategic Powers - Chair: Dr. Rodney Jones

8:45-9:15 *Power Cycle Theory And The Onset Of War In South Asia*
Dr. Daniel Geller, University of Mississippi; Consultant, US Department of State

9:15-9:45 *Strategic Stability in South Asia*
Dr. Peter Lavoy and Mr. Feroz Hassan Khan, US Naval Postgraduate School

9:45-10:00 Break

Session 6: Modeling and Predicting Strategic Stability - Chair: Mr. Larry Sanders

10:00-10:30 *Strategic Offense, Defense, and Arms Control (SODAC) Model*
Mr. Guy Grundman and Mr. Karl Serafin, SPARTA

10:30-11:00 *Near Term Forecasts of Crises and Instability Using Text Based Events*
Dr. Sean O'Brien, Center for Army Analysis

11:00-11:30 *Sex, Games, Values and Rationality: Shortcomings of Stability Models*
Mr. Dennis Powell, Los Alamos National Laboratory

11:30-12:30 Lunch

Session 7: Novel Approaches to Modeling Stability - Chair: Mr. Dennis Powell

12:30-1:00 *Agent-Based Simulation of the Socio-Economic, Cultural, and Political Factors which Motivate Islamic Terrorism*
Dr. Edward MacKerrow, Los Alamos National Laboratory

1:00-1:30 *Greek Fire and Cliometrics: Extreme Weapons and the Mathematics of History*
Mr. Bruce Colletti and Mr. Frank Wolfe, SAIC

1:30-1:45 Break

Fifth Nuclear Stability Roundtable
April 28-29, 2003

Agenda

Day Two: Tuesday, April 20, 2003 (cont'd)

Session 8: Enhancing Deterrence Stability - Chair: Dr. Tom McIlvain

1:45-2:15 *Crossing the Nuclear Threshold: The New Dynamics of Escalation*
Dr. Kerry Kartchner, US Department of State

2:15-2:45 *Impact of External Costs on Theater WMD Decision Logic*
Dr. Greg Canavan, Los Alamos National Laboratory

2:45-4:00 ***Unclassified Roundtable Summary and Discussion***
Lewis Dunn, SAIC

4:00 Roundtable Adjourns

List of Participants

First Name	Last Name	Affiliation
Bob	Batcher	U.S. Department of State
Geoff	Bent	SPARTA
Jerome	Bracken	U.S. Department of State
Amanda	Brady	SAIC
Kristi	Branch	Pacific Northwest National Laboratory
Greg	Canavan	Los Alamos National Laboratory
Christine	Cleary	SAIC
Andrew	Coe	Institute for Defense Analyses
Bruce	Coletti	SAIC
Mike	Connors	AF/XONP
Randy	Correll	SAIC
William	Cotsworth	Los Alamos National Laboratory
Carmel	Davis	University of Pennsylvania
Alexis	Delaney	SAIC
Lewis	Dunn	SAIC
Gerald	Epstein	DTRA/AS
Fritz	Ermarth	SAIC
Kevin	Farrell	NIWA/US Navy
Debora	Fisher	U.S. Department of State
Robert	Fisher	PDAS/U.S. Department of State
Phillip	Foley	U.S. Department of State
Denis	Garcia	CSC/Dyncorp
Dan	Geller	U.S. Department of State
Greg	Giles	SAIC
Bill	Green	CSU San Bernadino
Richard	Gullickson	DTRA/AS (Director)
Guy	Grundman	SPARTA
David	Hamon	DTRA/AS
Frank	Handler	Lawrence Livermore National Laboratory
Douglas	Hill	TRW
James	Howe	Boeing
Trent	Hughes	OPNAV
Rodney	Jones	DTRA/AS
Janet	Jones-Oliveira	Pacific Northwest National Laboratory
Kerry	Kartchner	U.S. Department of State
Feroz	Khan	Naval Postgraduate School
Arthur	Kuehne	U.S. Department of State
Edward	Lacey	U.S. Department of State
Peter	Lavoy	Naval Postgraduate School
Douglas	Layton	TRW
Don	Linger	DTRA
Dunbar	Lockwood	U.S. Department of State
Karen	Look	DAS/U.S. Department of State
Edward	MacKerrow	Los Alamos National Laboratory
Bob	McCreight	U.S. Department of State
David	McGarvey	U.S. Department of State

Bill	Mangiante	Westinghouse
Tom	McIlvain	U.S. Department of State
Pat	McKenna	STRATCOM
Jose	Mendez	Advanced Strategic Missile Division/ICBM System Program Office
Jeff	Milstein	DTRA/AS
Mitch	Nikolich	National Security Research, Inc.
Robert	Rauchhaus	Princeton University
Andrea	Ritchie	Systems Planning and Anaylsis, Inc.
Stan	Riveles	U.S. Department of State
Elizabeth	Rood	U.S. Department of State
Steve	Rosenkrantz	U.S. Department of State
Sean	O'Brien	Center for Army Analysis
Edwin	Parks	J-5/NAC
Keith	Payne	DAS/Office of the Secretary of Defense
Roderick	Peoples	Air Force Space Command
George	Pitman	U.S. Department of State
Pete	Planchon	Argonne National Lab
Dennis	Powell	Los Alamos National Laboratory
Jane	Purcell	U.S. Department of State/AC
Larry	Sanders	DTRA/AS
Cherita	Saunders	SAIC
John	Schlosser	U.S. Department of State
Gene	Schroeder	Los Alamos National Laboratory
Karl	Serafin	SPARTA
Robert	Sherman	U.S. Department of State
Daniel	Sigg	STRATCOM
Michael	Simon	SPARTA
Roger	Speed	Lawrence Livermore National Laboratory
Ted	Strickler	STRATCOM
Matt	Stumpf	U.S. Department of State/AC
Victor	Utgoff	Institute for Defense Analyses
Bernie	Victory	Office of the Secretary of Defense
Brad	Walker	SAIC
Michael	Wheeler	SAIC
Peter	Wilson	RAND
Frank	Wolfe	SAIC
Joseph	Wolfsheimer	DTRA
Valery	Yarynich	CSU San Bernadino
Tom	Yehl	U.S. Department of State
David	Yost	Naval Postgraduate School
Dave	Zusi	Nuclear Support Staff/Office of the Secretary of Defense

Fifth Nuclear Stability Roundtable: "Strategic Stability in a Turbulent World"
April 28-29th, 2003
Abstracts

Session 1 – Preemption and Stability

Preemption, Legitimacy, and Stability: Some Organizing Principles
Michael Wheeler, Science Applications International Corporation (SAIC)

Abstract: The National Security Strategy of the United States, issued by the White House on September 20, 2002, included a number of themes, the most controversial of which was the formalization of American policy on preemption. Since September 2002, the question of what is meant by the American policy of preemption has become the center of a firestorm of controversy, currently coming to a head in the debate on whether to use force against Iraq. In his paper, Dr. Wheeler draws upon ongoing research to explore the issue of what preemption in fact appears to mean in American policy, to place preemption in the context of the changing norms of international conflict, and to explore the principles that legitimize preemption. The paper also clarifies what preemption has meant in the past and appears to mean today, explores the relationship between discrete preemptive actions or campaigns and preventive wars, discusses how preemption fits both within the just war *ad bellum* tradition and the laws of war, reviews the arguments of critics of the American position, and seeks a middle ground that establishes the legitimacy of preemptive military action, especially as it relates to nuclear proliferation. Finally, the paper contrasts the case of Iraq with that of other nations, especially North Korea and Iran.

Missile Defense as an Alternative to Preemption or Retaliation
Kerry Kartchner, US Department of State

Abstract: The pros and cons of preemption are currently the subject of intense interest in the U.S. national security community, especially to the extent that preemption may be considered an alternative to the traditional deterrence concept of retaliation. The United States has embarked on a program to deploy missile defenses against the full range of ballistic missile threats. At the same time, U.S. policy pronouncements assert continued U.S. adherence to deterrence as a primary pillar of U.S. security policy. President Bush has called for the development of "new approaches to deterrence that rely on both offensive and defensive means." In this context, this paper explores the potential contributions of missile defense to deterrence, as well as to U.S. nonproliferation objectives. It also examines the potential contribution of missile defenses to other key national security objectives, such as crisis management, protection against accidental or unauthorized launch of ballistic missiles, and as a response to threat posed by mobile ballistic missiles to U.S. forces deployed abroad. The paper concludes by discussing how missile defenses may be a potential means of mitigating the downsides to preemption on the one hand, and retaliation on the other hand.

Session 2 - Regional Challenges

Stability Model of Northeast Asia

Kristi Branch, Pacific Northwest National Laboratory

Abstract: Beginning in the fall of 2000, Pacific Northwest National Laboratory, in association with SAIC, constructed a stability model of the Northeast Asian region under the sponsorship of the Office of the Secretary of Defense, Office of Arms Control Implementation and Compliance. The tool used to construct and analyze the stability model was the Situational Influence Analysis Module (SIAM™), a software application that facilitates a process called *Influence Networks*. The methodology facilitates recognition and evaluation of important relationships among events by breaking down complicated issues of cause-and-effect into their fundamental components. The result is a more detailed level of thinking than that provided by intuition alone. Fact-based information, expert judgments, levels of confidence and degrees of uncertainty are incorporated into the *Influence Net.* The presentation will describe the study methodology, including the "pillars of stability." In addition, it will discuss how this more comprehensive view of stability avoids "surprises" and artificial constraints when seeking regional security solutions, and facilitates an increased understanding of the connection between regional stability and U.S. security interests.

East Asian Stability Challenges

Peter Wilson, RAND

Abstract: Northeast Asia is going through a dramatic political-military crisis (i.e., an historical version of "punctuated equilibrium") after the DPRK admitted to the US that it had a secret and parallel uranium enrichment program during the late summer of 2002. A U.S. decision to cut off the flow of oil as part of the bilateral 1994 Agreed Framework (to close down the North Korean nuclear weapon program) has prompted Pyongyang to take a hard-line on the issue including a decision to formally withdraw from the NPT. Now, negotiations between Washington and Pyongyang and hosted by Beijing have begun in an attempt to resolve this very significant crisis. This presentation will discuss the implications of several different outcomes to those negotiations and their implications for the near- and medium-term "stability" of the vital region of Northeast Asia in the context of the post-Iraq War geo-strategic environment.

Session 3 - Nuclear Posture Review

Unintended Consequences of Strategic Adaptability

Guy Grundman and Michael Simon, SPARTA

Abstract: The recent U.S. Nuclear Posture Review (NPR) outlines significant changes to America's strategic nuclear force, among them, the recommendation that the U.S. maintain a warhead reserve to augment operationally deployed forces in certain contingencies. The rationale behind the move is to preserve "strategic adaptability"—the

flexibility to respond to a highly uncertain future. However, strategic adaptability runs the risk of exacerbating uncertainty that may cause states to misperceive or misconstrue American intentions. This study addresses whether keeping an operational warhead reserve will result in "unintended consequences" (i.e. competition, arms race, tension) for the United States. The authors build a game-theoretic model of nuclear stockpile decision-making, which examines how potential adversaries may adjust their own strategic stockpiles in response to U.S. behavior. The results of the model are first tested against empirical data from similar situations. The model's findings are further applied to strategic profiles of both Russia and China. Ultimately, the study seeks to answer whether strategic adaptability will provoke a response and, if so, what kind.

Protection from Sabotage Through Modeling

Valery Yarynich, Visiting Scholar, University of California, San Bernadino

Abstract: There is a potential danger that terrorists can penetrate the command system of one of the nuclear weapons states and initiate a mass "blind" nuclear strike. The clearly unacceptable nature and scale of the consequences of such sabotage requires not only mutual trust between members of the "nuclear club" but also reliable knowledge of the real protection mechanisms for each country's C3 systems. Only C3 experts, working jointly, can provide this knowledge to their political leadership. Currently, international cooperation in the C3 sphere is absent. To promote development of cooperative C3 relationships, joint modeling of hypothetical nuclear conflict has been proposed, with specific emphasis on the C3 factor. This presentation discusses how relative transparency will allow for joint efforts to address the C3 negative control problem.

Alliance Relations and Concepts of Assurance, Deterrence, and Dissuasion

David Yost, US Naval Postgraduate School

Abstract: This paper analyzes the concepts of assurance, deterrence, and dissuasion articulated in the Quadrennial Defense Review, the Nuclear Posture Review, and the National Security Strategy of the United States. It then examines the implications of these concepts for America's alliance relations, notably in NATO. One of the main conclusions of this paper will be to identify tensions among the QDR goals of assurance, deterrence, and dissuasion in America's relations with its allies, and to suggest ways in which these tensions can be managed or reduced. It will also discuss how to subject such conclusions to critical analysis in further research about the policies and assessments of allied governments, notably in crisis situations. The objective is to clarify the practical operational utility of the concepts of assurance, deterrence, and dissuasion, and to specify how they might be employed to greater advantage in alliance relations.

Session 4 - Classified Presentations

(U) *A Game Theoretic Exploration of Escalation in a Taiwan Crisis*
Victor Utgoff, Institute for Defense Analyses

Abstract: (U) At the fourth Nuclear Stability Roundtable, Dr. Utgoff presented a simple game-theoretic study of PRC-US escalation in a Taiwan crisis. That examination treated Taiwan as a pawn in a two-player game between the US and the PRC. It showed that, when the US lacks missile defenses, the set of all "optimal" strategy pairs (in the sense of being Nash equilibria) contains strategies in which the US elects to abandon Taiwan. On the other hand, if the US is assumed to have missile defenses, then abandonment is never optimal. This year's presentation will discuss the results of a more elaborate three-player game, one in which Taiwan is an active participant. The game has also been expanded to include options for: conventional defense by Taiwan; offensive and defensive conventional US campaigns; and nuclear counter-force and counter-value strikes by the US and the PRC.

(U) *India-Pakistan Nuclear Stability During Conventional Warfare*
Jerome Bracken, US Department of State

Abstract: (U) One of the most salient nuclear stability problems of the post-Cold War era involves the escalation of conventional warfare between India and Pakistan. At some point in time during such a war, one or both sides might determine a need to launch a first strike with nuclear weapons. Currently, perhaps the most important stability question with implications for U.S. policy is what effect ballistic missile defense (BMD) will have on such crisis scenarios. The paper examines this aspect in particular. In addition, the paper investigates force structure changes that might increase stability.

(U) *Non-Strategic Nuclear Weapons*
Dunbar Lockwood, US Department of State

Abstract: (U) Recently, we have seen increased interest in addressing the uncertainties surrounding Russian non-strategic nuclear weapons (NSNW). One reason members of Congress, the media, and think tank analysts have turned their attention to NSNW is the conclusion of the Moscow Treaty, which does not cover NSNW. A second reason is heightened concerns in the post-September 11th environment about al Qaeda and other terrorist groups acquiring Russian nuclear weapons. A third is the increased emphasis that the Russian military has been giving NSNW in its military doctrine in recent years. This presentation will focus on Russian NSNW and U.S. diplomatic efforts to address these concerns. Two of the key questions the talk will examine: is the problem posed by Russian NSNW primarily a proliferation or a Russian military threat?; and how do we get the Russians to engage on U.S. proposals to be more open about their NSNW?

Session 5 - Emerging Strategic Powers

Power Cycle Theory And The Onset Of War In South Asia

Daniel Geller, University of Mississippi, Consultant US Department of State

Abstract: Power cycle theory was originally developed to explain and predict the war behavior of major powers at the apex of the global hierarchy. However, its potential relevance in regional dynamics may help account for conflict among states at lower levels of international status, wealth, and material capabilities. Applying power cycle theory within a regional context, this study explores possible global ramifications of a South Asian nuclear arms race. The dyadic Indo-Pakistani military competition, according to power cycle theory, cannot find resolution except in a dynamic regional equilibrium involving China, India, and Pakistan. Moreover, among the possible consequences of an Indo-Pakistani nuclear arms race are a growing mutual security threat between India and China, the passage of China through a critical point in its power cycle, and an increased probability of international conflict.

Strategic Stability in South Asia

Feroz Hassan Khan and Peter Lavoy, US Naval Postgraduate School

Abstract: The goal of this paper is to conduct a comprehensive analysis of the key elements that must be included in modeling strategic stability in South Asia. The project will analyze how conventional and nuclear deterrence operate between India and Pakistan. Elements of stability will be identified, as well as elements of instability. In addition to analyzing the elements required to model strategic stability in the context of the dynamic India-Pakistan strategic rivalry, the co-authors will identify possible U.S. defense policy initiatives that could enhance strategic stability in South Asia.

Session 6 - Modeling and Predicting Strategic Stability

Strategic Offense, Defense, and Arms Control (SODAC) Model

Guy Grundman and Karl Serafin, SPARTA

Abstract: The Strategic Offense, Defense, and Arms Control (SODAC) Model simulates strategic nuclear interaction among multiple state actors and across various measures. SODAC aims to provide U.S. decision-makers with a desktop computer resource to analyze the effects of bipolar and multipolar strategic competition, as well as the trade-offs between competition and cooperation in a changing, and increasingly complex, strategic environment. To better introduce SODAC to an audience of potential users, this presentation will discuss example cases that demonstrate the model's capabilities and utility. The cases featured in this presentation highlight plausible strategic scenarios and the questions that are associated with them. They include:

- Bilateral strategic competition between the United States and China, with U.S. missile defense deployments and off-setting Chinese modernization/armament

- Great Power strategic interaction involving a developing Sino-U.S. arms race and a renewed Russo-American arms race

Finally, the presentation will touch on how SODAC could be used to address current regional issues and new potential crises, including strategic competition between India, Pakistan, and China, and the impact of a North Korean nuclear capability.

Near Term Forecasts of Crises and Instability Using Text Based Events

Sean O'Brien, Center for Army Analysis

Abstract: The purpose of this study is to develop, validate, and bring online a capability to systematically monitor (in near real time) the conditions within countries that could lead to instability, violent crises, and armed conflicts. To do so, the model links macro-structural trends at the national level, dynamic events or "triggers" at the sub-national level, and foreign policy decision-making attributes to elucidate the nature, evolution, and timing of crises. These data are collected and assimilated in near real time from Reuters News Reports for some 50 countries using a frame parsing technology developed by Virtual Research Associates, Inc. This paper reports on emerging results. Specifically, it illustrates how stock market forecasting techniques, among others, can be applied in an early warning framework to accurately forecast (several months in advance) relative shifts in levels of political violence and contentiousness between civil organizations and state authorities. Nationally Significant Events (e.g., Intifada, outbreak of civil war, breakdowns in ceasefires) are used to validate the signals generated by the model. The paper describes the techniques used and their application to forecasting relative shifts in contentiousness and violence in Israel, Algeria, Former Yugoslavia, Rwanda, China and elsewhere. Finally, it demonstrates the utility of these techniques to anticipate inflections in relative levels of hostility and cooperation between India and Pakistan over the period 1988-2001.

Sex, Games, Values and Rationality: Shortcomings of Stability Models

Dennis Powell, Los Alamos National Laboratory

Abstract: Ambassador Linton Brooks stated at the 2002 Stability Round Table that existing models of strategic stability are inadequate in that they do not satisfy the needs of policy makers and analysts with respect to their need for insight on topical issues involving stability. This paper explores factors that could enhance the fidelity and utility of strategic stability models and demonstrates why these factors are important. Much criticism of existing stability models is directed at the exclusion of relevant factors or the assumption of particular conditions, such as a bipolar political structure and a focus on purely coercive measures. Current game theoretic approaches do not account for the evidence that internal groups in a state wield powerful influence on the development of capabilities and safeguards for strategic systems. From an organizational theory perspective, rational deterrence theory is less potent than many advocates believe. Other factors such as state goals, cultural values, traditional state strategic concerns, resource limitations, technology capability, risk perception of the political leadership, and international structures play roles in a stable configuration of nations. Risk perception is known to be sensitive to the sex and the world-view of the perceiver. All these factors

are reviewed in a context of the modeling process for the complex, many-faceted phenomenon of strategic stability.

Session 7 - Novel Approaches to Modeling Stability

Agent-Based Simulation of the Socio-Economic, Cultural, and Political Factors which Motivate Islamic Terrorism

Edward MacKerrow, Los Alamos National Laboratory

Abstract: The rise of Islamic terrorism around the world is considered to be the result of many complex and interrelated issues associated with globalization and cultural penetration of the West, along with other factors, into predominantly Muslim regions. In many cases intra-state conflict results from extremist Islamic opposition to both the local regime and to the Western states allied with the local regime -- making it difficult to strategize robust stability policies. Many of the perceived causes for this social unrest have been well-stated by Islamic fundamentalists as obvious determinants of conflict. Other causal factors may not be as obvious and might be better understood by applying methods from Computational Socio-Economics, i.e. "agent-based" approaches. In collaboration with the Defense Threat Reduction Agency, Los Alamos National Laboratory has developed a simulation framework for this purpose. Our end goal is to provide policy makers with decision support based on socio-economic computer "experiments" representing known militant and terrorist groups, ethnic and culturally defined groups of agents, Western and Middle-Eastern states and regimes, and their interrelated political economies. This framework will allow for scenario and strategy testing aimed at global stability. In his presentation, the author describes the building blocks of this model and demonstrates the progress made.

Greek Fire and Cliometrics: Extreme Weapons and the Mathematics of History

Bruce Colletti and Frank Wolfe, SAIC

Abstract: The rise and fall of civilizations, war and peace between nations, and inter-personal strife and harmony all submit to the "human condition" that writes history. Here the authors survey cliometrics (the mathematical modeling of history) to sketch analytic models to glean dynamics that affect national interests.

A cliometric model may reveal how "extreme weapons" affect geopolitical stability. Such weapons are those that surprise an enemy and include the modern examples of weapons of mass destruction, prompt global strike, computer network attack, disabling infrastructure and cultural influence campaigns that sap the resolve of the adversary or inspire hope in a changed political order. By understanding the conditions that have given birth to extreme weapons and sustained their use, we gain insight into the effective use of weaponry. Via narrative and demographics, the cliometric model helps a decision maker understand how the employment of a new military capability leads to enhanced security or merely compels adversaries to seek direct or asymmetric countering strategies.

Controlling Chaotic Games: A Possible Approach to Stability Control
Zoltan Toroczkai, Los Alamos National Laboratory

Abstract: In temporally evolving complex games, such as an international system of states, the players must learn their strategies as the game evolves. Due to imperfect information and the high dimensionality of the problem in strategy space, the agents' behavior will be that of bounded rationality. Under these conditions, learning can lead to a failure of convergence to a Nash equilibrium, and to an unstable and chaotic behavior for the game, as it was shown very recently. For these regimes, we propose the employment of well-known chaos, and nonlinear instability control mechanisms within the model, to detect and suppress departures from regions of stability. It is important to emphasize that in order to reach stability, these controllers adaptively use 'smart' infinitesimal perturbations to the dynamics parameters, in our case to the players' payoffs. The controller will be able to suggest strategy modifications from the phase space to move the system closer to a stable region and bound it away from regions characterized by the use of undesired actions/strategies (such as nuclear weapons).

Session 8 - Enhancing Deterrence Stability

Crossing the Nuclear Threshold: The New Dynamics of Escalation
Kerry Kartchner, US Department of State

Abstract: Throughout the nuclear era, we have frequently used the term "nuclear threshold" but have not always clearly defined what that means. A review of the literature suggests it has been used in two broad senses; either to refer to that point at which a conventional conflict becomes a nuclear conflict (nuclear first use), or, more recently, to denote that point at which a country acquires nuclear capabilities (in a proliferation sense), whether or not they are used in combat. Currently, we often hear talk about whether certain military capabilities, either when initially acquired by the United States (e.g., mini-nukes), or when introduced into a regional context (missile defenses for India), will "raise the nuclear threshold," or "lower the nuclear threshold," but again it is not clear what that means, what the dynamics involved are, or what the policy implications are. This paper reviews the uses of the term "nuclear threshold," and explores those factors related to "raising" or "lowering" the nuclear threshold, with attendant ramifications for U.S. strategic nuclear weapons acquisition policy, and for charting U.S. multinational missile defense cooperation efforts.

Impact of External Costs on Theater WMD Decision Logic
Greg Canavan and John Immele, Los Alamos National Laboratory

Abstract: The game-theoretic analysis developed for crisis stability is extended to the determination of the optimal decisions in theater engagements involving WMD. The ultimate decision by the militarily stronger side to use WMD is based on a straight-forward calculation of their costs and benefits, but the earlier decisions leading to it are more complex and incorporate the deterrent value of WMD to both sides. In this

presentation, the authors will discuss the impact of external costs, such as the political costs of civilian casualties and collateral damage, on the decision to use WMD.