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Nicole Whealen 767.6354

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BRANCH CHIEF / PHONE / EMAIL:

DIVISION CHIEF / PHONE:

DIRECTORATE / DIRECTOR / PHONE John Byrd 767.5787

ENTERPRISE / OFFICE / PHONE:

PUBLIC AFFAIRS:

Richard M. Cole (Chief, PA) / Gaines

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ORIGINATOR Larsen, Jeffrey; Holdorf, Polly; Hamon, David

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Strategic Stability at Low Numbers of Nuclear Weapons

REPORT OF THE 10th STRATEGIC CONCEPTS ROUNDTABLE

24-26 August 2010
Doolittle Hall
US Air Force Academy

Compiled by
Jeffrey Larsen
Science Applications International Corporation

and

Polly Holdorf
Toeroek Associates, Inc.

November 2010

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Defense Threat Reduction Agency
Advanced Systems and Concepts Office
8725 John J. Kingman Road
Ft. Belvoir, VA 22060-6201

ASCOInfo@dtra.mil



Strategic Stability at Low Numbers of Nuclear Weapons

Report of the
10th Strategic Concepts Roundtable

Hosted by
USAF Institute for National Security Studies
for the
Advanced Systems and Concepts Office of the
Defense Threat Reduction Agency

Doolittle Hall
US Air Force Academy

24-26 August 2010

Compiled by
Dr. Jeffrey Larsen, SAIC
and
Ms. Polly Holdorf, Toeroek Associates, Inc.

Strategic Stability at Low Numbers of Nuclear Weapons

Key Workshop Findings & Questions

How do we define strategic stability? The term “strategic” is not necessarily synonymous with nuclear weapons; when the role of conventional forces grows, stability analysis becomes less straightforward.

Stability is something that must be continually cultivated – we cannot just achieve stability and then walk away from it.

Where is the bottom of the thermonuclear ladder? It may be prudent to work on the first part of the problem--determining the final number--before working on the mechanics of the process. It is difficult to conceptualize the final stages of disarmament.

It is not clear how quickly we will go to even moderately lower numbers through the arms control process, much less reach a point where we're in the hundreds of weapons. We need to speak less generally and more specifically about what we mean by low numbers.

Small nuclear weapons states depend heavily on the deterrent effect of their nuclear weapons and may not envision strategic stability as being viable at numbers much lower than what they already possess. It is, therefore, an illusion to assume that there is a global consensus that calls for the end of nuclear weapons production and the institution of global disarmament. Some small nuclear weapons states cheering for US and Russian reductions remain hesitant or unwilling to follow suit.

Will a reduction in nuclear weapons create greater security, or can we only reduce the number of weapons once security concerns have been reduced?

Optimists in the debate believe that the Cold War is over, deterrence is easy, and new threats from loose nukes are not subject to deterrence. This group sees no role for nuclear weapons and advocates zero as our goal. Conversely, pessimists do not believe that the Cold War is completely over, believe that the future is uncertain, and advocate maintaining some nuclear weapons as a hedge against future threats.

What capabilities would be required if we needed to pursue regime change in a nuclear-weapon state? What would keep that state from thinking it had to cross the nuclear threshold out of desperation?

As nuclear weapons decrease in number, how will the United States continue to deter adversaries while simultaneously assuring friends and allies?

The triad continues to retain the most deterrent value, but it will require significant investments in the bomber force for that leg to remain viable at lower numbers. In addition, in the event that we actually found ourselves in a situation in which we would have to use a nuclear weapon, it would be to our advantage to have a highly accurate, prompt, low-yield option available, rather than having to rely on large yield weapons from the legacy arsenal.

The Obama administration has embraced missile defense as a key enabler of the reduction of the role of nuclear weapons while on the path to global zero, and linked the reduction of nuclear salience in regional deterrence to increased theater missile defense. The Ballistic Missile Defense Review lists multiple missions to which missile defense will contribute.

The tenor of the current US discussion on nuclear weapons ignores the reality of potential conflict and assumes that we can deal with all remaining security threats against the United States with conventional forces. Advocates of abolition assert that by disposing of all its remaining nuclear weapons the United States would be setting a positive example for the rest of the world without substantially jeopardizing US national security. That may not be the case, however—there are several escalatory pathways which could lead adversaries to use nuclear weapons against the United States in future conflicts.

The common assumption is that important developments in the security environment and in our key relationships would have to take place before we can reach a world with 500 nuclear weapons. But is that necessary? Is it likely?

In a world with low numbers of nuclear weapons there must be reliable verification and monitoring procedures so that militarily significant cheating can be detected and addressed.

Finally, a central question must be addressed: What is the problem for which the elimination of nuclear weapons is the solution? Is it the existence of the weapons themselves, the use of nuclear weapons, or both? It would behoove the United States to answer this question before committing to further dramatic reductions.

Strategic Stability at Low Numbers of Nuclear Weapons

Conference Report

The Conference and Venue

The 10th annual Strategic Concepts Roundtable took place August 24-26, 2010 at Doolittle Hall, the Association of Graduates building, on the grounds of the United States Air Force Academy in Colorado Springs, Colorado. This was the sixth year that the event was held in Colorado Springs. The roundtable was sponsored by the Defense Threat Reduction Agency's (DTRA) Advanced Systems and Concepts Office (ASCO) and hosted by the Air Force Institute for National Security Studies (INSS). This year's conference discussed strategic stability as we approach very low numbers of nuclear weapons.

Speakers on five panels considered a number of issues related to strategic stability at low numbers, including the context of the nuclear drawdown, threat and capability balances at low numbers, strategic requirements, and management issues. Presentations were given on the following topics: perspectives on global zero; limited nuclear conflict scenarios; deterrence and deterrence failures; strategies and postures at low numbers; stockpile choices; and stability at low numbers.

Introduction and Overview

Dr. James Smith, Director of the Air Force Institute for National Security Studies, and Mr. David Hamon of DTRA/ASCO made introductory remarks highlighting the importance of this study to the small group of assembled experts. .

The 2008 elections brought a new president to the White House who represented the middle ground between the old Cold War dichotomy of hawks and doves—representing what Joseph Nye dubbed in the late 1980s the “owls.” The Obama administration marked the return of strategic issues in national security considerations, and the president's April 2009 speech in Prague set the stage for the New START Treaty and the Nuclear Posture Review. These and other US policy documents published this year emphasize a cautious approach to disarmament and a central role for deterrence, stability, and nonproliferation efforts.

In terms of the renewed emphasis on disarmament, the organizers of this workshop felt that it might prove valuable to posit a world in which we have much lower levels of nuclear weapons, and work backwards from that future scenario to set precedents and establish the processes that will lead us to the outcomes we want to achieve.

We also need to consider that deterrence may not remain the central organizing concept for US security that it has been for more than 60 years. We need to think outside the box about future security requirements. In order to help us do that, here are some key questions that demand consideration during this and future conferences on this subject:

- How should we think about deterrence upon reaching a stockpile consisting of fewer than 500 nuclear weapons?
- How will those numbers affect the broader strategic environment?
- Has the term “strategic stability” lost its meaning? Does it need to be re-thought?
- At low numbers, what are our choices based on the capabilities of the remaining stockpile?
- What happens if we experience a failure of deterrence along the way to lower numbers?
- What guidance can we give the US Navy and US Air Force as we go to lower numbers and potentially fewer missions?
- If nuclear weapons can be quickly reconstituted once everyone reaches low numbers, how do we plan to prepare for or react to such a breakout?

Perspectives on Global Zero

Setting the Stage: Some Background on the Topic

The first speaker focused his presentation on preliminary conceptual puzzles related to global zero and nuclear drawdown; reviewed recent nuclear drawdown plans; and assessed and took stock of the issues.

When thinking about “low numbers” of nuclear weapons most people think in numerical terms of tens to hundreds of weapons. Would we still be in the realm of mutual assured destruction (MAD) at those numbers? Is there a natural “lowest number” which would constitute the final step before we reached zero? It should be noted that low numbers of nuclear weapons are only part of the nuclear marginalization equation. The Nuclear Posture Review (NPR) calls for both lower numbers and reduced roles for nuclear weapons.

How do we define strategic stability? The term “strategic” is not necessarily synonymous with nuclear weapons; when the role of conventional forces grows, stability analysis becomes less straightforward.

The speed of drawdown is a factor which must be considered when planning for the transition to low numbers of nuclear weapons. How important is the speed of drawdown in relation to timing and sequence, parallel security issues, how reductions are achieved, or the attributes of the remaining weapons? Some motivations for a quick drawdown include the avoidance of a potential catastrophe; the prevention of nuclear use; and the possibility that bold action taken by

the nuclear-weapon states may bolster the nonproliferation regime. Conversely, some reasons to draw down more slowly include military prudence and the possibility that small, slow steps may be required in order to assess the inherent risks associated with each new stage of reductions.

What is the bottom of the thermonuclear ladder? It may be prudent to work on the first part of the problem, determining the final number, before working on the mechanics of the process. It is also important to consider the views of small nuclear-weapons states when thinking about the path towards zero. One approach is to look at the minimum arsenal size required by small nuclear weapons states. These states depend heavily on the deterrent effect of their nuclear weapons and may not envision strategic stability as being viable at numbers much lower than what they already possess.

There are various ideas regarding drawdown speeds which can be characterized as:

- Very Rapid Drawdown
 - Sidney Drell and James Goodby, “What are Nuclear Weapons For? Recommendations for Restructuring U.S. Strategic Nuclear Forces” (2005)
 - Ivo Daadler, “Stepping Down the Thermonuclear Ladder: How Low Can We Go?” (1993)
- Scheduled Rapid Drawdown
 - The Global Action Plan of 2010
- Partially Rapid Drawdown
 - Stansfield Turner, “Caging the Nuclear Genie” (1998)
- Measured Drawdown
 - The Stimson Center, “Phased Nuclear Disarmament and US Defense Policy” (1996)
 - A 2009 plan by the International Commission on Nuclear Nonproliferation

A comparative assessment of the various drawdown plans is difficult as there is no consensus regarding what needs to be done about non-strategic nuclear weapons. There is little actual analysis about what specifically constitutes a non-strategic weapon, or about the possibility that non-strategic nuclear weapons may become increasingly important as total numbers of nuclear weapons decrease.

Most drawdown plans assume that we will retain a state-based deterrent system. However, some plans call for an international force option in which a small nuclear arsenal would remain under the control of the United Nations.

Finally, some important first order questions remain: If we can reduce the roles of nuclear weapons faster than numbers, what impact would this have on strategic stability? Does intellectual honesty dictate that in the final analysis the only appropriate answer to whether low numbers are stable is “we don’t know?” What non-nuclear capabilities are needed to underwrite

a move to lower numbers? What strategic and political conditions are required to support lower numbers?

Getting in Touch with Your Personal Nuclear Asymptote

There is a strong drive to reduce the size and salience of nuclear weapons arsenals, and the issue is likely to continue to pick up political steam. However, it is an illusion to assume that there is a global consensus that calls for the end of nuclear weapons production and the institution of global disarmament. There are small nuclear weapons states on the sidelines that are cheering for US and Russian reductions, yet remain hesitant or unwilling to follow suit.

Strong countervailing pressures against further reductions exist due to the fact that nuclear weapons continue to play a central role in many states' security perspectives. From a Russian perspective, for example, pressures against reductions stem from the centrality of nuclear weapons in Russian security policy and concerns regarding US ballistic missile defenses, non-deployed US nuclear weapons, US conventional precision strike forces, and US dual-capable forces. From a US perspective, pressures against reductions stem from the centrality of nuclear weapons in US security policy; concerns regarding Russian tactical nuclear weapons; Russia's weapons production capacity; and the need to reassure allies. Some mutual and broader concerns include accounting and verification of offensive and defensive systems; the prospects for future multilateral negotiations; and nuclear infrastructures and virtual nuclear arsenal capacity.

There are two possible next steps in international arms control efforts: a US-Russian bilateral agreement, or the first truly multilateral agreement. A bilateral reduction to 1,000 operationally deployed strategic nuclear weapons appears to be an achievable goal in the near term, and one that avoids many contentious issues that may complicate further reductions (such as ballistic missile defense and non-strategic nuclear weapons). A multilateral agreement to reduce to a total of 1,000 accountable strategic and tactical weapons would be a significant milestone, but far more challenging. Nonetheless, reductions to lower levels will eventually have to include all nuclear states. See Figure 1 for an overview of those steps.

The Nuclear Asymptote Construct: Navigating Toward Progressive Steady States

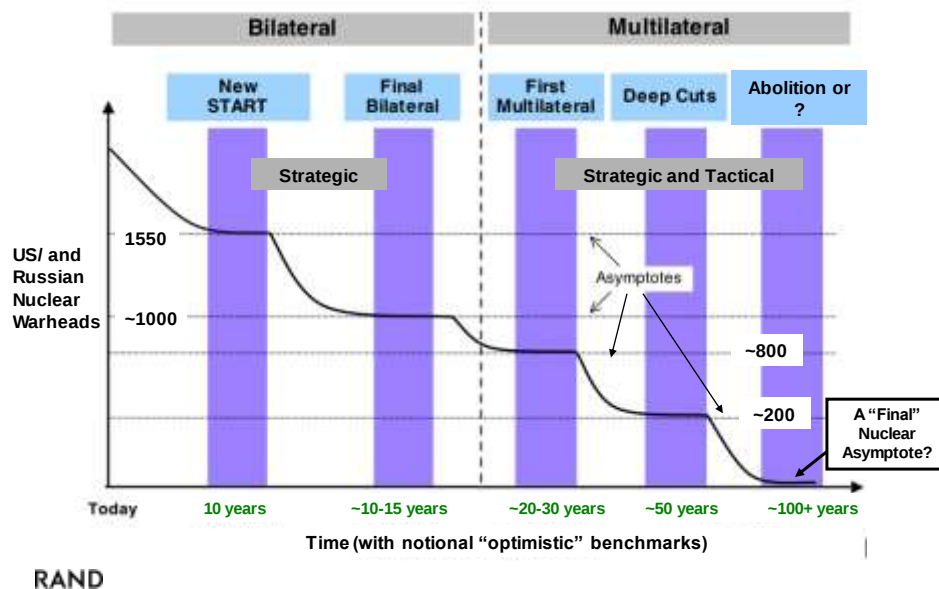


Figure 1

The negotiations of both a final bilateral agreement and a first multilateral agreement are likely to face significant challenges.

A central question which must be addressed is: What is the problem for which the elimination of nuclear weapons is the solution? Is it the existence of the weapons themselves, the use of nuclear weapons, or both?

When considering the future of nuclear weapons we must be clear regarding the specifics of our ultimate goal. What are the alternative long-term nuclear asymptotes? One option is nuclear abolition, with no extant nuclear arsenals. Another is virtual nuclear abolition in which the size of existing or retained arsenals is very small (10-20 weapons). Yet another option is something along the lines of “family atomics” from the book *Dune*, in which nuclear capabilities remain hidden in the background, but everyone is aware of their existence. In this case countries could be expected to keep perhaps 100-200 weapons each in order to deter aggression by retaining the ability to inflict severe damage on an aggressor.

Regardless of how quickly or slowly disarmament occurs, nuclear weapons will remain at the forefront of the nuclear weapons states’ military capabilities. At some point during drawdown, the status of one’s reserve forces and one’s ability to regenerate its forces will become crucially important. Because of this there will be serious verification and compliance issues as lower numbers are approached. It is difficult to conceptualize the final stages of disarmament. For example, how will we move from the 200 range to zero? Simultaneous elimination?

Proportional elimination? Will states lose interest when very low numbers are achieved and agree to maintain small arsenals instead of going all the way to zero?

When zero is reached or imminent, virtual arsenals, infrastructure capabilities, and the existence of both delivery vehicles and civil nuclear power plants will mean that a state's ability to quickly reconstitute a modest nuclear force will be a concern. How can virtual nuclear arsenal capabilities be constrained? How will we measure what a virtual capability can achieve, regarding both the number of weapons that could be developed and the amount of time that it would take to complete them? When considering a state's virtual capabilities it is important to remember the equation: "Nuclear power requires nuclear engineering, which equals nuclear weapons know-how."

Questions Generated from Discussion

- Would a move to low numbers imply a shift from counterforce to countervalue targeting? At low numbers, while MAD may not apply as it did during the Cold War, assured destruction may return to take its place.
- Could a "nuclear non-use treaty" be negotiated? It was suggested that such a treaty might build on the concept of a nuclear taboo and create a strengthened norm against nuclear use.
- What would be the role of politics in nuclear reductions? Domestic debate over the ratification of the New START Treaty may exemplify how political tensions or disagreements could delay or derail progress on the path to zero.
- Will a reduction in nuclear weapons create greater security, or can we only reduce the number of weapons once security concerns have been reduced? It was suggested that the threat dyads which exist today are unlikely to change and that in the future states will continue to face threats that will make the possession of nuclear weapons appear not only attractive but necessary.
- Is it wise to assume that 50 years from now the national security threats perceived today by the nuclear weapons states will have disappeared?
- Who has the right to have nuclear weapons? Some might argue that everyone has a right to nuclear weapons; others would say that no one has a right to them. The United States once armed itself with nuclear weapons when it faced a threat from a large, malevolent enemy, claiming that a large number of nuclear weapons with multiple options were needed to enhance the credibility of deterrence. How can the United States tell other states that the threats which they face today do not necessitate the development or the stockpiling of nuclear weapons? Are the threats they face any less real than the ones the United States once faced?
- It was suggested that instead of marching toward zero, perhaps we should be pushing toward a world of equalized nuclear levels among all states. Is that a viable goal? Is it a desirable goal? Would it be possible to obtain domestic political support for this goal?

Limited Nuclear Conflict Scenarios

Perhaps the contemporary debate about the elimination of nuclear weapons is misguided. Optimists in the debate believe that the Cold War is over, that deterrence is easy, and that new threats from loose nukes are not subject to deterrence. This group sees no role for nuclear weapons and advocates aiming for zero. Conversely, there are pessimists who do not believe that the Cold War is completely over, believe that the future is uncertain, and advocate maintaining some nuclear weapons as a hedge against future threats.

The speaker believed that the problem is much more difficult and that innovative strategic thinking, new policies, and perhaps some new capabilities are required in order to address it. We should expect that the United States will find itself in a conventional conflict with a nuclear armed state at some time in the future. The main deterrence problem that the United States is likely to then face is coercive escalation by a weaker nuclear-armed state for the purpose of stalemating the conflict. There is a need for analysts and policy planners to think about how rival nuclear-armed states might respond to US dominance during a future conflict.

We should remember that during the Cold War coercive nuclear escalation was the US strategy, not only to deter nuclear attack, but also to deter conventional attack on NATO and to mitigate the conventional imbalance vis-à-vis the USSR. What if future enemies think the same way that the United States thought from the 1950s through 1970s? Their situations may actually be worse than that of the United States during the Cold War. Other states not only face the problems that we once faced, but our regional wars are their total wars, and the American approach to conventional war is deliberately escalatory. Escalation dynamics have not disappeared; rather they are reversed from our experience.

Some key strategic questions for the United States might include the following:

- How do we limit ourselves to something short of pursuing regime change when in conflict with a regional adversary? What is an acceptable end state for a conventional conflict?
- What capabilities would be required if we *needed* to pursue regime change in a nuclear-weapon state, while keeping that state from thinking it had to cross the nuclear threshold?
- How do we wage war in a way that convinces our adversary that regime change is not our goal?
- Can the United States restrain conventional operations in order to avoid threatening the vital strategic interests of an adversary?
- How do we reassure our allies in such wars, particularly when they bear larger risks of nuclear retaliation?
- What deterrent strategies and capabilities would most effectively deter an adversary's coercive nuclear escalation during a conventional conflict?

- What threats could the United States issue that would be credible? What threats would be the least bad if we had to carry them out?
- What deterrence strategies, capabilities and assurances would most effectively save or preserve alliances?

Discussion and Further Questions

One participant asked “what is the nature of war itself?” It seems to be assumed that war involves state vs. state and force-on-force conflicts. What is our war-termination aim? Do we want to end a future conflict in a way that sets precedents on future international behavior?

A key point of the presentation was that the speaker thinks that the analytic community has misperceived the danger of nuclear war by looking at it as the possibility of major nuclear exchanges between states currently at peace, rather than the more likely scenario of smaller nuclear exchanges during conflicts involving smaller nuclear-armed states. The Iran-Iraq war of the 1980s is an example of how a future conflict between two or more regional adversaries might escalate to nuclear use. The Iran-Iraq war witnessed an increase from conventional capabilities to a deliberate escalation to chemical weapons when regime survival appeared to be at stake.

Regarding limited war, one participant suggested that no matter how limited we think we are keeping our plans; we are always going to target the things that allow us to execute the war on our terms. The United States will consistently target an adversary’s ability to see, hear, and communicate. The adversary’s response will be shaped by the communications they’ve had with us in the weeks preceding the commencement of hostilities. We need to think about how the adversary will interpret our actions.

There was some debate over whether an adversary would assume that the United States was seeking regime change once a war began. Declaratory policy may not have a significant influence over what an adversary thinks while under attack. This issue matters because the adversary’s leadership may be more or less likely to release nuclear weapons or other WMD based on their anticipation of US goals.

Deterrence and Deterrence Failures

Nuclear Policy Impacts at the National Laboratories: Maintaining the Deterrent

How do we maintain a credible and usable nuclear weapons stockpile as we move towards zero?

The president and his administration have a vision for the nuclear security of the United States while pursuing a world without nuclear weapons. The 2010 Nuclear Posture Review (NPR) fleshes out key elements of the president’s nuclear policy. The NPR policy framework involves preventing nuclear proliferation and terrorism; reducing the role of US nuclear weapons;

maintaining strategic deterrence and stability at reduced nuclear force levels; strengthening regional deterrence and reassuring US allies and partners; and sustaining a safe, secure and effective nuclear deterrent.

The NPR reaffirms the continuing role of deterrence for the foreseeable future and the vision of a world free of nuclear weapons. While these two objectives are not incompatible, there are several questions that must be addressed, such as:

- What level of deterrence is achievable from conventional capabilities, considering that conventional weapons are designed for war fighting and not deterrence?
- For how long will the United States maintain its conventional weapon superiority?
- As nuclear weapons decrease in number, how will the United States continue to deter adversaries and assure friends and allies?
- How will the United States maintain extended deterrence at lower levels of nuclear weapons?
- What happens if deterrence fails and the United States comes under attack?
- What happens if our friends and allies lose confidence in our extended deterrence commitments?

The enhancement of regional security architectures involves three main components: 1) retaining the capability to forward-deploy US nuclear weapons on tactical fighters and heavy bombers; 2) proceeding with a full scope life extension of the B61 bomb; and 3) retiring the nuclear sea-launched cruise missile (TLAM-N). Reinforcement of strategic stability with Russia and China involves dialogue, transparency and the de-MIRVing of each side's intercontinental ballistic missile force.

A current challenge is to make sure that deterrence does not fail and the United States and its allies do not come under attack. The use of technology is important in this process. Detection, forensics and attribution technologies are necessary to ensure that the United States maintains a viable deterrent capability. Further, it is essential that the nuclear stockpile be sufficiently maintained. To date we have been able to care for the current stockpile using investments made in the Stockpile Stewardship Program. We will require further stewardship investments for the near- and long-terms. These investments must be applied towards stockpile life extensions, science, technology, engineering and infrastructure. Today's stockpile will not last for several additional decades without sustainment. There are components that will need to be replaced in order to maintain reliable and usable weapons.

Over the last few years both Los Alamos and Lawrence Livermore National Laboratories have lost a significant number of staff members (roughly 2,000 out of 10,000 at each lab) due to budget reductions. This has been damaging to the labs as a significant amount of expertise in critical areas has been lost. It is particularly important to maintain the people within the nuclear

weapons establishment in order to retain adequate deterrent capabilities. A number of other challenges will need to be addressed:

- Establish a sustained, adequate budget to ensure stability in the workforce
- Ensure a stable, achievable scope to meet national weapons strategy
- Deal with increasing requirements
- Ensure good governance in the National Nuclear Security Administration (NNSA)
- Allow the nuclear sites to manage construction line items to best meet program needs
- Pursue integration across the NNSA to meet broader national security needs.

Assessing the Risk of Deterrence Failure

The perceived risk of deterrence failure has a strong influence on national security policy, particularly in the areas of missile defense, preventive attack doctrine, and nuclear abolition, but is too often based on intuition and a limited perspective rather than on a synthesis of the broadest expertise and the most appropriate analytic methods that can be brought to bear. We need to either make the case that the risk of deterrence failure is unknowable, or greatly improve the current approaches to assessing the risk.

US presidents have taken various approaches to address their concerns regarding deterrence failure. President Ronald Reagan looked to missile defenses, President George W. Bush favored a preemptive doctrine, and President Obama is an advocate of nuclear abolition.

The 2005 Lugar Survey on Proliferation Threats and Responses assessed the probability of an attack involving a nuclear explosion occurring somewhere in the world in the next ten years. The survey demonstrated that the question of the probability of nuclear war is relevant to policy makers, analysts and the public; but did not make use of best practice elicitation methods. The speaker and his colleagues also looked at a number of individual quantitative judgments regarding the probability of nuclear terrorism and nuclear war and found that the assessments vary widely and are of questionable validity.

A research team at the Johns Hopkins Advanced Physics Laboratory put together a research agenda with the intention of evaluating the utility and feasibility of assessing the risk of deterrence failure, charting the research path forward in order to illuminate the limitations of previous analyses and address vagueness and uncertainty. They assessed multiple fields, including physical consequences of nuclear use; human and organizational psychology; probabilistic risk assessment; historical case studies; expert knowledge elicitation; complex systems theory; social sciences; and sociopolitical consequences of nuclear use. They found that the feasibility of quantifying risk depends on the precision needed, and that concluding that the risk of deterrence failure cannot be quantified is in itself a useful result.

Is an assessment of the risk of deterrence failure worth doing?

- Nuclear deterrence is a high-stakes strategy. Prudence dictates doing all we can to understand the inherent risks in that strategy.
- Existing analyses are limited in scope. We can improve on these analyses.
- Decision and policies will be made based on intuitive assessment of risk.
- Risk assessment is a prerequisite to risk management.
- Even learning that there is no sound analytic basis to favor one judgment over another would be worthwhile.
- An “authoritative” study could stimulate additional research and set a high bar for analytic rigor.

If such analyses are worth doing, how should they be done? The speaker recommended that one start with defining an answer that could be helpful to policy making. Analyses within our grasp can significantly improve on current studies, but research in methodology development has less certain longer term benefit.

Random Thoughts on the Nuclear Drawdown

The speaker highlighted the similarities and differences between the global zero initiative and President Reagan’s 1983 call for a Strategic Defense Initiative (SDI). There are considerable similarities between the two visionary appeals: both were motivated by fear of deterrence fragility; both were utopian presidential initiatives that had long-term goals; each is polarizing, with less than enthusiastic ally and adversary support; both required a leap of faith; and there are similar concerns with instabilities at the end state and during the transition. But each is also unique, with key differences: SDI was something that the United States could achieve unilaterally, acted as an impediment to arms control, and was mostly a technological problem. On the other hand, global zero requires international cooperation, arms control is essential, and this is mostly a political problem.

The speaker addressed the terms “strategic stability,” “deterrence,” and “strategic influence.” He defined strategic stability as the resilience of the international political order to disruption that could lead to strategic conflict. He defined deterrence as the prevention of action by fear of consequences. He suggested that strategic influence is composed of a number of elements, including compellence, deterrence, dissuasion, prevention, and cajoler/bribery/appeasement.

The following list identifies some issues that must be addressed as we move toward lower numbers:

- Greater emphasis on countervalue targeting, but not necessarily

- All-out nuclear war would be less horrific—but would it remain horrific enough to deter its outbreak?
- The political climate that attends low numbers
- Greater utility in having, rather than using, nuclear weapons
 - Multipolarity, including formal alliances and tacit cooperation, and increased incentives to keep out of others' nuclear disputes
- Ties to nonstrategic nuclear weapons, conventional global strike weapons, missile defenses
- Increased relative uncertainties

The speaker hypothesized that the political climate that enables low numbers provides the stability that low numbers themselves only partially undermine, but the instability of the political climate may pose new dangers.

Strategies and Postures at Low Numbers

Shaping US Nuclear Forces for the Future

What will the purpose of US nuclear forces be in the future, and what might those forces look like?

The speaker presented a briefing based on a larger study which was completed for US Strategic Command's Senior Advisory Group and presented to the Air Force Association convention. The study focused on strategic forces and classic deterrence objectives versus other major powers. It posed this question: What is the best way to reduce US strategic nuclear forces in order to meet START Follow-on Treaty goals while maximizing the deterrent value and stability of the triad?

In the study, elements taken into consideration in order to determine the value of the existing Triad, as well as potential dyads and monads, included warheads on alert; survivability (day-to-day); survivability (generated); number of aimpoints; ability to penetrate; promptness; signals of alert/readiness changes; crisis stability; and connectivity/ease of retargeting. Those factors are shown in Figure 2.

Potential Posture Options Are Measured Against Existing Triad Attributes

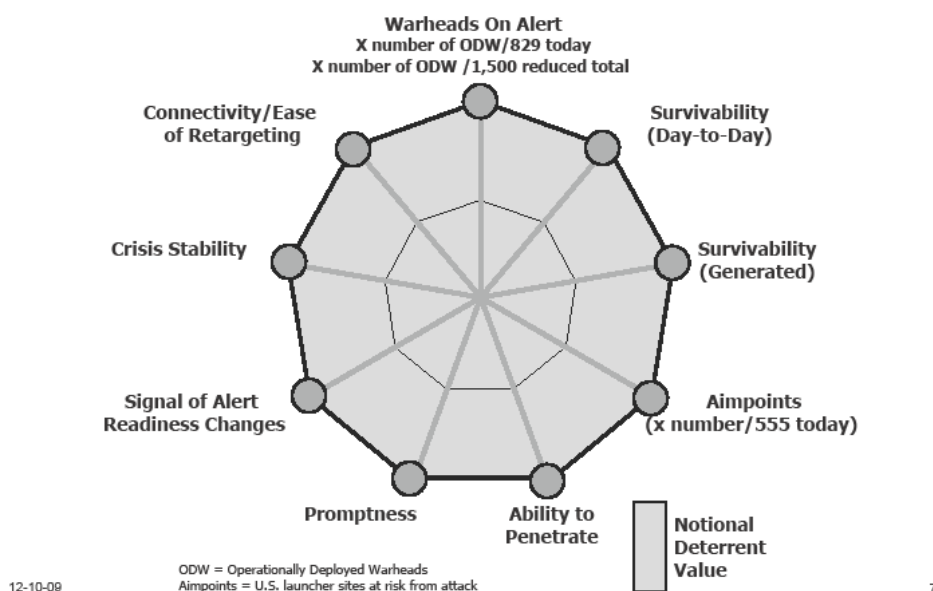


Figure 2

The speaker used a baseline chart to determine the major aspects for the Triad in general, and then assessed each leg of the triad to determine what happens to overall deterrence levels when removing each leg of the triad. The only monad option assessed involved SSBNs as the sole delivery platform. The addition of bombers to SSBNs to form a dyad did not add any significant improvement. This could lead to the conclusion that the bomber leg is not vital, which raised questions by multiple Air Force bomber communities. The speaker made it clear that discounting the value of the bomber was not the intention.

The study found that a triad of delivery vehicles continues to retain the most deterrent value, but will require significant investments in the bomber leg to ensure that the manned aircraft leg remains viable. The attributes of a monad are weaker than the existing triad or other dyad options. A monad would reduce the overall US deterrent to one similar to those of the UK and France.

Of the dyads examined, the ICBM/SLBM combination offered the greatest deterrent value. This dyad would provide a strong deterrent posture within new START's 1,550 warhead limit when measured against the current triad. It would maintain approximately the same number of warheads on alert as today's force and would leverage positive attributes of both legs relative to the existing triad.

The overall assessment was that the triad is still the best structure, but should the United States need to downsize to a dyad, dropping the bomber leg would seem to have the smallest impact on deterrence.

This analysis raises several important questions. As the US nuclear force is downsized, what do we want to do with it? Replace nuclear bombers with conventional bombers? Replace ICBMs with conventional global strike? Think about a future conventional triad?

Discussion

One participant wondered what the experiment might look like if we contemplated a world in which we had only 100-200 warheads, rather than 1,550. In that scenario would the bomber's flexibility be more valuable? Another participant suggested that we might benefit from taking into account future increases in adversary delivery capabilities as we consider our own force needs.

An assumption that did not appear to be reflected in the study is the nature of a potential conflict. A one-shot war would likely require different capabilities than a longer term extended conflict. An extended conflict would likely require equipment that would need to return to a home station for regeneration.

Strategies and Postures at Low Numbers: The Role of Missile Defenses and Prompt Global Strike

In 1985 Paul Nitze spoke about a future transition away from nuclear weapons due to missile defense technology which was to be developed over the coming decade. According to the speaker we are now well into that transition era. Missile defenses have achieved bipartisan political support and funding levels have been stabilized and sustained. Substantial missile defense capabilities have been fielded and NATO is acquiring theater missile defense capabilities. The ABM Treaty has faded away without a whimper, and yet the world has not seen the offense-defense arms race that some naysayers predicted.

The Obama administration has embraced missile defense as a key enabler of the reduction of the role of nuclear weapons while on the path to global zero, and linked the reduction of nuclear salience in regional deterrence to increased theater missile defense. The Ballistic Missile Defense Review lists multiple missions that missile defense will contribute to.

The concept of prompt global strike (PGS) grew out of General James Cartwright's desire at STRATCOM to be able to strike any target anywhere in the world in one hour's time. The PGS family of technologies includes payloads for ICBMs, SLBMs, hypersonic cruise missiles; air-launched missiles; and potentially even launch platforms in space. Issues with PGS that have been identified include the necessity for immaculate intelligence; the need to avoid

miscalculation; the possibility of misinterpretation of the purpose or intended target of a US strike leading to crisis instability; the need to minimize over-flight of non-concurring nations; the need to reassure allies; and the need to comply with arms control constraints.

Opponents of PGS argue that the expense of acquisition and the risk associated with the system make the concept unjustified. They maintain that pressures on adversaries could put the United States on the path to nuclear use if the adversary were to escalate in response (the commitment trap). Opponents further argue that the short response time associated with PGS would place significant stress on the national decision-making process. Proponents of PGS point out that it is endorsed by nearly the entire defense community; it would complement deployed forces; it is both technologically feasible and relatively inexpensive; it is not subject to arms control restraints; and it would provide the president with more usable and credible options in the event of a crisis.

The speaker listed a number of mitigating measures to counter the arguments against PGS, and a list of factors that allow one to compare the value of nuclear weapons against the value of PGS. See Figures 3 and 4.

MEASURES OF EFFECTIVENESS	Nukes?	PGS?
Global reach	X	X
Prompt execution	X	X
Multi-theater execution (robustness)	X	X
Survivability and reliability (wpn and delivery system)	X	X
High-payoff target defeat	X	X
Interoperability (linkage to C4ISR, etc)	X	X
Precision effects	?	X
Large-scale effects	X	-
Hard target kill	X	?
Reliability	X	?
Safety	X	X
Surety	X	X
Cost effectiveness (versus target/versus alternatives)	?	X
Penetration against defenses	X	X
Political and cost sustainability	?	?

Figure 3

TARGETS	Nukes?	PGS?
WMD (e.g., production, storage, launch facility, delivery vehicles, staging areas, agent defeat)	X	X
Leadership Elements	X	X
Critical infrastructure (e.g., command and control facilities, communications, power plants, POL storage)	X	X
Counterspace capabilities (ASAT infrastructure)	X	X
Critical anti-access nodes (transshipment sites)	X	X
Airfields, ports, and choke points (Lines of Communication)	X	X
Global War On Terrorism (GWOT) targets	?	X
HDBTs	X	?
Military-sustaining industry	X	NO
Population/counter-value	X	NO
Strategic offensive weapons arsenal/infrastructure	X	NO

Figure 4

Questions from Discussion

- What should the United States give up while transitioning away from reliance on nuclear weapons? Missile defense cannot perform certain missions, such as offensive strikes or territorial occupation, and it cannot assure the destruction of an adversary – it can only provide damage limitation. PGS cannot deliver wide scale kinetic effects, threaten regime survival or national existence of the adversary, or defeat massed targets, but it is affordable and adaptable.
- Can missile defense or PGS provide the political leverage and symbolic global leadership that nuclear weapons confer on the United States today?

Stockpile Choices

The Unspoken Nuclear Revolution: Implications for US Force Structure

The tenor of the current domestic discussion on nuclear weapons ignores the reality of potential conflict and assumes that we can deal with all remaining security threats against the United States with conventional forces. Advocates of abolition assert that by disposing of all its remaining nuclear weapons the United States would be setting a positive example for the rest of the world without substantially jeopardizing US national security. The reality is that there are

several escalatory pathways which could lead adversaries to use nuclear weapons against the United States in future conflicts.

The United States faces four unappealing choices in the event of enemy coercive escalation:

1. Accept the adversary's demand for a cease fire.
2. Continue conventional operations, even in the face of nuclear strikes by the adversary.
3. Conduct nuclear strikes on the enemy leadership.
4. Conduct conventional and/or nuclear counterforce strikes to limit the damage to the United States and its allies.

There is no silver bullet to prevent escalation in future conflicts, and interstate deterrence will become more difficult in the coming decades. New deterrence challenges are arising as the foundations of deterrence theory are cracking. Low-yield nuclear weapons may provide a key missing capability and turn out to be the least-bad alternative. Low-yield weapons are not as terrible as high-yield weapons and may provide the United States with a counterforce alternative that falls somewhere between conventional and high-yield nuclear weapons.

The lethality of nuclear weapons comes from prompt effects (blast, fire, prompt radiation) and radioactive fallout. Prompt effects tend to be relatively localized and the magnitude of the effects is principally a function of yield and height of burst. Fallout can potentially have a greater lethal effect and make low-casualty nuclear war unfeasible. However, significant levels of deadly fallout can be avoided by adjusting the height of burst and using a very low-yield weapon (less than 1 kiloton). At the proper burst height, with sufficient overpressure, the target can be effectively destroyed and the number of casualties from fallout reduced significantly.

A report by Hans Kristensen and Robert Norris of the Natural Resources Defense Council several years ago examined the fallout problem. The report studied a hypothetical limited US nuclear strike against China and utilized HPAC software to determine the level of damage. The simulated 20-warhead strike resulted in over 3 million people killed from radioactive fallout. The speaker and his colleague used the same model and software to simulate a similar attack with low-yield weapons. The result was that the number of casualties was reduced to less than 700. They then used the same methodology to assess an attack on North Korean nuclear forces. A nuclear strike against isolated targets with 10 high-yield weapons from the US arsenal led to approximately 2 million fallout casualties in South Korea and Japan. However, when the same exercise was run using four low-yield B61s per target, the casualty rate dropped nearly to zero.

Regarding the implications for US force structure the speaker reiterated the need for prompt, accurate, low-yield and optimized counterforce systems. Three questions were raised: Will the air-launched cruise missile be replaced? Will we keep the B61? Will we build a new nuclear bomber? The speaker recognized that there will continue to be a need for "old fashioned" high-yield nuclear weapons for deterrence purposes and for possible use against certain targets. However, in the event that we actually found ourselves in a situation in which we would have to

use a nuclear weapon, it would be to our advantage to have a highly accurate, prompt and low-yield option available. We also need improved navigation, guidance, and better intelligence, surveillance, and reconnaissance capabilities in order to locate targets and aim points, particularly mobile systems.

The speaker concluded by stating that there is a need for an analytical effort to identify strategies for deterring escalation in conventional wars. Six key questions were posed:

- Who are we trying to deter?
- From doing what?
- In what circumstances are they likely to do those things?
- What specific threats are we going to make to prevent them from doing that?
- Do we have the capabilities to do so?
- What if we fail?

Discussion

Two participants speculated that it may be extremely difficult politically to move in the direction of low-yield nuclear weapons. For example, during the George W. Bush administration Congress blocked the development of the robust nuclear earth penetrator, presumably because it did not want to provide that administration with a new nuclear system. Another participant wondered if it would be any different today under a Democratic president. Given the president's vision of global zero, the development of new nuclear weapons would be a particularly difficult sell. Another participant pointed out that it might be very difficult to change either the public or congressional mindsets. The speaker suggested that there may be a way to improve the hard target kill capabilities of existing warheads without violating any of the New START provisions or the president's restrictions on new weapons or new military capabilities.

Strategic Stability at Low Numbers

The speaker began by stating that we need to think about stability as we move into a world whose salient characteristics are 1) smaller US and Russian arsenals based on negotiated reductions; 2) a concerted effort by the United States to reduce the salience of nuclear weapons in its security policies and the circumstances under which nuclear weapons might be used; 3) the real possibility that we will have to live with radical regimes in possession of nuclear weapons in two critical regions for some period of time; and 4) the possibility that resultant proliferation pressures in these regions and the continued growth in nuclear latency will be a steady source of anxiety. The issues of nuclear abolition and stability need to remain separated during this analysis.

It is essential to define what we mean by low numbers, and we need to do so with a sense of perspective. We are at historically low numbers today and still counting in the thousands in terms of total stockpile and operationally deployed weapons. It is not clear how quickly we will go to even moderately lower numbers through the arms control process, much less reach a point where we're in the hundreds of weapons. We need to speak less generally and more specifically about what we mean by low numbers.

The common assumption is that important developments in the security environment and in our key relationships would have to take place before we can reach a world with 500 nuclear weapons. What would a world of 500 nuclear weapons look like in the broader context? How would we get to that world? Would there be a regulated balance, and if so, how would it be regulated? What agreements, safeguards and hedges would need to be in place? Would regulations cover only numbers, or also the composition of forces? We need to differentiate between problems that are driven by lower numbers and problems that are not.

If we were to reach a state of significantly lower numbers, other kinds of considerations would come into play when thinking about stability. The core issue for stability would be how to ensure that the low numbers regime would be resilient against upsets or shocks that could lead to renewed nuclear competition, and where small changes or perturbations did not cascade into large problems or crises.

The speaker suggested a new way to think about these issues in a way that builds on a recent paper by Rich Wagner and John Immele of Los Alamos National Laboratory which discussed possible requirements for stability based on a continuum of scenario space and time.

1. First strike/crisis stability—the stability of forces in being in order to avert us of nuclear weapons in a short time frame (minutes to days). This is a more traditional concept.
2. Mobilization stability—stability over weeks to months to avoid races to generate or mobilize forces or to reconstitute capability. This would be concerned not just with the nuclear dimension, but also with possible asymmetries of capability in other strategic forces.
3. Infrastructure stability—dealing with weapons development and production over many months to years.

Infrastructure stability is a key element when looking at a framework for stability and it is something that requires focused analytic attention. The Wagner-Immele paper does a good job of addressing this. The paper attempts to balance the traditional objectives associated with infrastructure (responsiveness to the needs of deterrence and dissuasion) against the requirements of stability at low numbers, which include some degree of restraint in responsiveness and the ability to verify this restraint. A major challenge is to think through the dynamics of multilateral stability over weeks, months, and years.

We also need to consider proliferation stability, or horizontal proliferation. How would a low numbers regime address the challenge posed by the emergence of a new and hostile nuclear challenger? In a world of low numbers, could a nuclear rogue be tolerated? If not, there must be collective resolve and capability among the major powers and the international community to defang or disarm such a state, perhaps by implementing regime change. If such regimes are tolerable, we need to define the terms under which they are tolerable. The speaker emphasized the need for a strategic forces toolkit that would ensure that any challenge from a nuclear rogue could be managed and prevented from destabilizing the low numbers regime.

The speaker concluded by suggesting some features of a stable nuclear arrangement among the major powers. Stability at this level does not require the elimination of strategic or political-military competition, but it does require that this competition be carefully managed, contained, and not dominated by nuclear weapons. Each power maintains an independent strategic posture. Force structures, production infrastructures, and doctrines do not incite competitive responses or contribute to arms races. Each power's nuclear capacities are well understood, well controlled, and well secured. There is ongoing strategic dialogue. The major powers view themselves as sharing in the management of the international system, the effective working of the international nonproliferation regime, and sustainment of the nuclear taboo.

Finally, the speaker left the participants with some questions for further consideration:

- How to organize and sustain multipolar deterrence?
- What is the applicability of minimum deterrence doctrines?
- How to ensure confidence in verification and monitoring capabilities?
- Is the regime stable against non-nuclear areas of competition?
- Do the stakeholders feel they have sufficient capability to deal with "local" security problems?

Final Reflections

The final speaker asserted that we must be attentive to politics on all levels, including the domestic, national, and alliance arenas. Legitimacy in the international system must be generally accepted. In the future, the concept of war will become even fuzzier. The rules of governing the global commons must include regulations for the governing of disputes, and we need to recognize that not all disputes necessarily need to be resolved. Stability must be continually worked on--we cannot just achieve stability and then walk away from it.

In a world with low numbers of nuclear weapons there must be reliable verification and monitoring procedures so that militarily significant cheating can be detected and addressed. A range of diverse levels of cheating will be possible, from the benign to the aggressive, and from the trivial to the significant. At some time in the future someone will chose not to abide by the

regime. It will be essential that the international community receive notification of a violation sufficiently early in order to deal effectively with the situation.

How do we define stability? Stability involves the preservation of the status quo and the ability to manage events. There must be a constant evolution towards achieving objectives. Stability requires the ability to stay afloat (the absence of war) and control the direction in which one is moving. It is essential that values be defined. There are a range of areas in which stability is important, and will remain important in the future: proliferation stability (both vertical and horizontal); crisis stability; enforcement stability; technological stability; geopolitical stability; political-military stability; and systems stability.

How will stability at low numbers differ from stability under nuclear plenty?

Strategic culture is another way to address the issues of deterrence, raising as it does questions such as what works, how much is enough, and so on. When inflicting pain on an adversary, how much is enough? We need to think strategically and act tactically. It is vitally important to understand one's adversary's strategic culture. This is a fundamental prerequisite for strategic predictability.

* * * * *

The workshop concluded with a commitment by all participants to consider the issues and questions raised at this roundtable over the coming months. The sponsor and host organizations were pleased with the discussion, and committed to carry on the debate on strategic stability at lower numbers in future forums.

Appendix 1

Conference Participants

Dr. Brad Beck, Los Alamos National Laboratory
Dr. Paul Bernstein, SAIC
Dr. Damon Coletta, AF/DFPS
Lt Col Colin Connor, Air Force Global Strike Command
Mr. Thomas Devine, SAIC
Ms. Christy Figueroa, AF/INSS
Dr. Schuyler Foerster, AF/DFPS
Dr. Robert Haffa, Northrop Grumman
Mr. David Hamon, DTRA/ASCO
Ms. Polly Holdorf, Toeroek Associates, Inc.
Dr. Kerry Kartchner, US Department of State
Dr. Jeffrey Larsen, SAIC
Dr. Keir Lieber, Georgetown University
Mr. Thomas D. Miller, SAIC
Dr. Roger Molander, RAND
Maj. Joseph Moschella, A5XP
Lt Col Lou Perret, AF/INSS
Dr. Daryl Press, Dartmouth College
Dr. Andrew Ross, University of New Mexico
Dr. James Scouras, Johns Hopkins Applied Physics Laboratory
Dr. James Smith, AF/INSS
Mr. Seth Snider, University of California, Davis
Dr. Michael Wheeler, Institute for Defense Analyses

Appendix 2

Conference Agenda

Wed, 25 Aug

0730-0800 Coffee/Registration (Doolittle Hall)

0800-0830 **Overview**
David Hamon, DTRA/ASCO
James Smith, INSS

Focus One: Context of Nuclear Drawdown

0830-1020 **Panel 1: Perspectives on Global Zero**
Seth Snider, UC Davis
Roger Molander, RAND

Focus Two: Threat/Capability Balances at Low Numbers

1040-1200 **Panel 2: Limited Nuclear Conflict Scenarios**
Keir Lieber, Georgetown University

1200-1300 Lunch Buffet

1300-1450 **Panel 3: Deterrence/Deterrence Failure**
Brad Beck, LANL
James Scouras, JHAPL

Focus Three: Strategic Requirements and Management Issues

1510-1630 **Panel 4: Strategies and Postures at Low Numbers**
Kerry Kartchner, Missouri State University
Robert Haffa, Northrop Grumman

1830 Informal Group Dinner, Glen Eyrie Castle

Thu, 26 Aug

0730-0800 Coffee (Doolittle Hall)

0800-0950 **Panel 5: Stockpile Choices**
Daryl Press, Dartmouth College

Focus Four: Synthesize the debates and suggest policy options for the “Road to Zero”

1010-1145 **Panel 6: Stability at Low Numbers**
Paul Bernstein, Consultant
Mike Wheeler, IDA

1145-1200 **Workshop Summary and Way Ahead**
David Hamon, DTRA/ASCO
James Smith, INSS