

**PROJECT ON NUCLEAR ISSUES FALL CONFERENCE
OFFUTT AFB
OMAHA, NEBRASKA
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PRESENTATION ABSTRACTS

SESSION ONE: NUCLEAR STRATEGY FOR THE CHANGING SECURITY ENVIRONMENT

Chinese Mobile Ballistic Missiles: Implications for U.S. Counterforce Operations

Matthew Hallex, MA Candidate, Security Policy Studies, Elliott School of International Affairs, The George Washington University

As part of an effort to build a more effective and survivable deterrent force, China has expanded the number of missiles it deploys and shifted a greater proportion of its deterrent forces to mobile systems including road-mobile missiles such as the DF-21, DF-31 and DF-31A. These new mobile capabilities make the task of tracking and targeting China's deterrent forces as part of US nuclear counterforce operations much more difficult. The relationship between the United States and China is the most important strategic dyad in the 21st century. Maintenance of a credible nuclear counterforce capability is necessary for maintaining the stability of this relationship and to discourage potential Chinese adventurism in regional hotspots such as the Taiwan Strait and the South China Sea. Mobility of Chinese nukes makes them difficult to track. US track record on mobile targets, including U.S. operations against Iraqi ballistic missiles in the first Gulf War and mobile ground targets in the air campaign against Kosovo, suggest that current US capabilities would be insufficient for conventional or nuclear counterforce operations. US space based surveillance assets would be particularly vulnerable to Chinese ASAT capabilities while manned and unmanned aerial assets would find it difficult to operate in the Chinese air defense environment. A troubling issue for US operations against Chinese missile forces is the problem of distinguishing between nuclear and conventionally armed targets. The United States cannot currently distinguish between units designated for nuclear and conventional operations and identical missiles are designated for both regional nuclear and conventional strike missions. US efforts to diminish Chinese conventional strike capabilities may be interpreted as a counterforce attack leading to unintentional escalation of the conflict. Current US capabilities are insufficient for counterforce operations to be conducted with conventional weapons and nuclear counterforce operations could not ensure the destruction of mobile missile systems without inflicting significant collateral damage to civilian populations. Improving US ISR capabilities, including more survivable space based assets and unmanned surveillance assets capable of penetrating Chinese air defenses, would bolster the ability of the United States to conduct counterforce operations. While such improvements would improve the ability of the US to eliminate Chinese nuclear weapons it is unclear if this benefit would outweigh the negative impact on deterrence stability.

Non-Strategic Nuclear Weapons and NATO's Strategic Concept Review

Mr. Grant Schneider, M.A. Candidate, The George Washington University

With further reductions in strategic nuclear weapon arsenals, both in Russia and the U.S., the role of non-strategic nuclear weapons (NSNW) in the context of strategic stability in Europe has grown. Indeed, Russia's declining conventional capability has caused it to rely more heavily on NSNW while many NATO allies see NATO's NSNW as an increasingly important guarantor of the alliance's cohesion. How the removal of NSNW in Europe would manifest itself and the implications of their removal are two

questions which have not been adequately studied. This presentation will evaluate paths to removing NATO NSNW (as well as options for dealing with Russia's NSNW arsenal) in terms of their effects on deterrence stability, alliance cohesion, and the advancement nonproliferation and disarmament. Their removal and its effects will be considered in the context of the upcoming NATO Strategic Concept Review. This presentation will argue that NATO NSNW have a much more modest deterrent value than is usually attributed when the array of nuclear forces deployed by the United States and Britain to protect the alliance is considered. Yet, some NATO allies worry about NATO's deterrent in the event of the removal of NATO NSNW vis-à-vis Russia's large NSNW arsenal. This presentation will examine paths to removal that effectively allay such concerns: what could NATO expect in return from Russia for the removal of NATO NSNW? What would be the nature of an agreement to limit or remove NATO NSNW? What is the role of the Conventional Forces in Europe treaty? Alliance cohesion is an important consideration when deciding how to remove these weapons: yet it is not a sufficient reason to continue with the status quo. The Strategic Concept Review provides the perfect opportunity to begin the process of removal of NATO NSNW while also considering the overall character of NATO's Strategic Concept with regard to nuclear weapons. NATO's past Strategic Concept, in dealing with nuclear issues, focuses almost exclusively on deterrence and defending against states which already have or may come to acquire nuclear weapons. The Strategic Concept review should seek to overlay the important nonproliferation objectives of all allies on that of NATO itself. Consideration of these concepts will require an overhaul of the traditional Cold War thinking laid out in the last Strategic Concept. Moving forward on these tracks will strengthen the alliance, increase stability and advance global nonproliferation and disarmament.

Balancing Assets and Liabilities: US Primacy and the Strategic Utility of Missile Defense

Michael Mayer, Visiting Fellow, CSIS, Doctoral Fellow, Norwegian Institute for Defence Studies

The marriage of nuclear weapons and ballistic missiles produces an instrument of political persuasion more than a usable military asset. Ballistic missile defenses therefore must be viewed in terms of their political and strategic impacts, not simply in military terms of defending the US from attack. Deployments and further development of BMD assets must continue to take into account possible and probable strategic and political effects – and opportunity costs – of deployment. To minimize these costs, the US should find the most advantageous balance of capabilities, including between theater and national defenses, and levels of deployed assets in various regions.

Understanding Saddam's Non-Use of WMD in the Gulf War

David Palkki, Institute for Defense Analyses

Ever since the Gulf War, scholars have debated why Iraq did not use chemical or biological weapons against Coalition forces or US allies. Many analysts have suggested that Saddam didn't use WMD because the ferocity of the Coalition onslaught, adverse weather, difficulties mating toxic materials with warheads, or other factors rendered Iraq physically unable to deliver them. Others argue that US Secretary of State James Baker's ambiguous warning that the United States would retaliate with nuclear weapon strikes, and/or by replacing Saddam's regime, deterred Iraqi use. I find that Iraq was physically able to attack Coalition forces and US allies with chemical and biological weapons, yet refrained from doing so for fear of US nuclear retaliation. Deterrence, however, was largely existential, as Saddam considered US nuclear strikes plausible long before US officials issued even the most veiled of threats. My argument is based on captured recordings of private conversations between Saddam and his inner circle, declassified US interrogation reports, defector accounts, and recently released memoirs. My findings have important implications for the ongoing debate over the role of the US nuclear arsenal and the question of a US no-first use declaratory policy.

SESSION TWO: NUCLEAR PROLIFERATION DRIVERS AND CONSTRAINTS

The Nuclear Posture Review and Getting to Zero: Are we safer?

Nancy E. Brune, Ph.D., Principal Member of Technical Staff, Sandia National Laboratories

One of the stated objectives of the 2010 Nuclear Posture Review (NPR) is to “reduce the salience of nuclear weapons” and move “step by step toward eliminating them.” But the Administration also reaffirms its commitment to maintaining a strong deterrent which forms the basis of U.S. assurances to allies and partners. The pathway – made explicit throughout the NPR -- for reducing the role of nuclear weapons while maintaining a strong nuclear deterrent and reinforcing regional security architectures is to give conventional forces and capabilities and missile defenses (e.g. “non-nuclear elements” a “greater share of the deterrence burden.” Unfortunately, this expressed pathway for achieving a world of greater peace and stability – and a world without nuclear weapons, is problematic. Recently, a number of scholars (Bunn and Chyba 2006, Brown 2008, Gerson 2009) have suggested that U.S. nuclear weapons are an “excuse rather than a reason for proliferation.” Rather, they argue, it is the “perceived threat of U.S. conventional capability” that has driven nuclear proliferation (Brown 2008). As Gerson (2009) writes: “For some regimes, nuclear weapons are an attractive means to offset U.S. conventional superiority” and deter a conventional attack (Brown 2009). This paper seeks to assess whether the NPR will be able to realize one its key objectives of reducing nuclear proliferation and nuclear terrorism given the current realities of the conventional-nuclear nexus (as discussed by Gerson, Brown, etc.). It also assesses long term U.S. security and security of our allies. Finally, this paper will attempt to sketch some possible strategies for discouraging nuclear proliferation in countries like Iran and North Korea.

Engaging the Scientific Enclave in India towards Nonproliferation post Indo-US Civilian Nuclear Agreement

Saurabh Dutta Chowdhury, Masters Candidate in Nonproliferation and Terrorism Monterey Institute of International Studies

Following its 1974 nuclear test, India increasingly turned to indigenously developed nuclear technology due to export controls on technology from Canada and the U.S. This indigenous effort was led by a scientific enclave that pioneered civilian and military programs, using common platforms in many cases. Until now, not much thought has been placed on how to bring the Indian scientific enclave onboard. This situation is risky from a proliferation standpoint as, all of a sudden, a powerful group with nuclear knowhow has been rendered powerless. This proposal seeks to address potential proliferation risks brought on by the US-India nuclear deal by engaging India’s nuclear community through Global Threat Reduction initiatives, encouraging peaceful, commercial applications of the enclave’s knowhow, and fostering exchanges with U.S. think tanks and academia.

The Proliferation Resistant Reactor

Dr. John Adams, Consequence Modeler, Atomic Weapons Establishment

The Thorium Energy Amplifier is a type of Accelerator Driven Sub-Critical reactor which uses Thorium to breed its fuel. Thorium is not fissile and thus such reactors are often claimed to be proliferation resistant. This presentation aims to analyse this claim by making reference to the fuel cycle and by making comparisons to the standard Pressurised Water Reaction.

Punishing Proliferators: The A.Q. Khan Network and Legal Obstacles to Prosecuting Nuclear Traffickers

Philip Johnson, Senior Research Fellow and M.A. Candidate, Georgetown University Department of

Government

The illicit transfer of nuclear weapons technologies and materials to non-nuclear weapons states and non-state actors has become a billion-dollar black market industry and poses an inestimable threat to international peace and security. The common thread connecting the world's most notorious proliferators, including North Korea and Iran, is the critical assistance their nuclear weapons programs have received from organized proliferation networks, such as the transnational nuclear smuggling operation organized by Pakistani scientist A.Q. Khan. Identifying nuclear smugglers is only half the battle to arrest nuclear proliferation. Many known proliferators have been arrested around the world and brought to trial on multiple occasions only to have international and domestic legal obstacles frustrate prosecution attempts. This presentation examines the cases of five Khan network affiliates in Germany, the UK, the Netherlands, and South Africa, identifies the common legal hurdles prosecutors faced in these cases, and suggests new domestic and international legal frameworks and avenues of cooperation to ensure the successful prosecution of nuclear traffickers.

SESSION THREE: RESPONDING TO THE THREAT OF NUCLEAR TERRORISM

Understanding the Nuclear Threat: The Integration of Science with Policy and Governance

Mr. Dan Dalton, Interagency and International Section Lead, Office of Nuclear Counterterrorism, National Nuclear Security Administration

President Obama has offered a vision of a world without nuclear weapons and stated that the most “immediate and extreme” threat to global security today comes from nuclear terrorism and nuclear proliferation. To mitigate these risks and move toward eventual nuclear abolition, nuclear threat reduction efforts and international work to counter nuclear threats must be appropriately informed by a thorough scientific and technological understanding of the full range of nuclear threat devices. Understanding the nuclear threat is the key to nuclear threat reduction. The United States must move toward a more integrated approach for countering nuclear threats to prevent or, if prevention fails, respond to a nuclear terrorist attack or loss-of-control of a nation-state nuclear weapon. This is best accomplished through an integrated, whole-of-government approach and close cooperation and collaboration with international partners. Policies and guidance for nuclear threat reduction (NTR) and countering nuclear threats (CNT) must be underpinned by accurate and timely scientific and technical (S&T) knowledge and research and development related to understanding nuclear threat device designs and how these affect all aspects of countering nuclear threats, including: material protection and security, detection, intelligence, interdiction, diagnostics, emergency response/disablement, forensics and attribution. Science and technology must inform intelligence, operational planning and related policies. Failure to integrate science and technology into the intelligence process and operational planning will result in uninformed policies, wasted resources and, ultimately, a potential failure to prevent a proliferant event or nuclear terrorist attack and the lack of an effective response. The United States must ensure that a thorough understanding of the threat informs all policies and activities to prevent a nuclear terrorist attack and stop or slow the proliferation of nuclear weapons.

Cosmic ray muon scattering tomography for security applications

Lindsay Cox, Atomic Weapons Establishment

Cosmic ray Muon Scattering Tomography (MST) is an innovative technique that uses naturally occurring background radiation to detect the presence of high Z material. MST works by measuring the trajectories of muons as they enter and leave an object. Those muons passing through high density material will tend to scatter through greater angles, allowing the distribution of material within the object to be inferred from determinations of many scattered muon tracks. Advantages of this technique include the passive

nature of cosmic ray muons, the amount of material the highly penetrating muons can traverse and the ability of the tomographic reconstruction to produce an image, or density profile, of the item of interest. As such, this presentation proposes and discusses applications of MST in the areas of homeland security (e.g., cargo scanning), treaty verification, and nuclear fuel storage (e.g., material security).

Forensic Analysis and Data Interpretation

Theodore Nichols, Post-doctoral Fellow, Savannah River National Laboratory

The Nuclear Forensics Analysis Center (NFAC) is part of Savannah River National Laboratory (SRNL) and is one of only two USG National Laboratories accredited to perform nuclear forensic analyses to the requirements of ISO 17025. SRNL NFAC is capable of analyzing nuclear and radiological samples from bulk material to ultra-trace samples. NFAC provides analytical support to the FBI's Radiological Evidence Examination Facility (REEF), which is located within SRNL. REEF gives the FBI the capability to perform traditional forensics on material that is radiological and/or is contaminated. SRNL is engaged in research and development efforts to improve the USG technical nuclear forensics capabilities. Research includes improving predictive signatures and developing a database containing comparative samples.

Nuclear Forensics: Information-Sharing Barriers and Mechanisms to Overcome Them

Daniela Helfet, U.S. Department of State, Bureau of International Security and Nonproliferation, Office of Weapons of Mass Destruction Terrorism

Nuclear terrorism is widely recognized as the greatest threat to U.S. national security. Nuclear forensics is a critical tool for countering this threat. By identifying the source of the material used in a nuclear terrorist attack, the US may be able to identify responsible parties in order to retaliate, secure vulnerable materials or deter future attacks. Effective nuclear forensics, however, requires the comparison of samples against known signatures of nuclear and radiological material. Nuclear forensics is currently limited by the extent and availability of data, comparison samples and expert systems essential to matching a questioned sample to a known sample. These barriers can be significantly reduced - and perhaps eliminated - through a coordinated strategy to develop and implement enhanced methods for sharing information, data and samples. This presentation will discuss the information-sharing barriers that currently exist and identify a series of mechanisms to overcome these barriers. Proposed methods include establishing cooperative legal frameworks to enable the sharing of nuclear forensics information, and developing national nuclear forensics libraries and international nuclear forensics databases. Through these mechanisms we can achieve greater international cooperation on nuclear forensics and reduce the likelihood of a nuclear terror attack.

SESSION FOUR: TECHNICAL CHALLENGES FOR STOCKPILE SUSTAINMENT AND NUCLEAR SECURITY

Developing and Maintaining Weapon Design Expertise in a Comprehensive Test Ban Era

James Cooley, X-4 Division, Los Alamos National Laboratory

The lack of clear national mission focus and declining budgets, along with the unclear long term commitment to the nuclear enterprise, is hindering the training and retention of high quality scientists necessary for future deterrence. This paper will discuss how the nuclear weapon design community is working to train future designers in a post-CTBT environment and compare this effort to the method used during the testing era. I will emphasize the importance of human judgement compared to the computational modelling capability provided by the science based stockpile stewardship program and discuss areas that need improvement to better train and validate the designer human judgment. I will also

identify areas which could be improved to encourage young scientists to choose a career in nuclear weapon design.

The CTBT and Zero Yield: A Technical Perspective

Daniel J. Dorsey, Ph.D., Principle Member of Technical Staff, Sandia National Laboratories

The Comprehensive Test Ban Treaty (CTBT) is a unique treaty in that it fails to define the event banned under the treaty: a nuclear explosion. Clearly, full-up testing of stockpile nuclear weapons is accepted as a banned activity. The status of lower level activities, such as hydrodynamic and subcritical testing is less clear. The term “zero yield” is often discussed, and a “zero yield” test ban was endorsed by the United States as CTBT negotiations were finalized. However, the words “zero” and “yield” do not appear in the treaty and are ambiguous themselves. This paper will summarize original interpretations of “zero yield” by signatories to the treaty and discuss the technical feasibility, or lack thereof, of achieving a zero yield state with nuclear materials. A discussion of criticality and the applicability of such a term to dynamic nuclear experiments will also be included. The overall thrust of the paper is that zero doesn’t really mean zero and that defining a nuclear explosion in the absence of a threshold is indeed a difficult task.

Nuclear Weapon Technology Close Kin: How the Non-Proliferation and Nuclear Counterterrorism Programs Leverage the Nuclear Weapons Complex Facilities and Expertise

Mr. Matt Cowan, Deputy Program Manager, Defense Technologies Engineering Division, Lawrence Livermore National Laboratory

The NNSA Non-Proliferation and Nuclear Counterterrorism programs utilize key expertise and facilities originally developed for the US nuclear weapon mission. The associated facilities and infrastructure are also managed and funded solely by the nuclear weapon program. Proposed infrastructure downsizing, modernization, and recapitalization efforts are optimized around the future needs of a reduced capacity weapons complex. The infrastructure decisions may greatly affect the Non-Proliferation and Nuclear Counterterrorism programs’ capability while not necessarily reflecting their needs. In light of the changing priorities illustrated by the most recent Nuclear Posture Review, I will outline how the facilities and expertise of these programs intersect and evaluate potential impact from proposed infrastructure downsizing on the NNSA Non-Proliferation and Nuclear Counterterrorism programs.