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Report on the INMM Workshop on Nuclear Arms Reductions to Address Technical Transparency and Verification Challenges

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Report on the INMM Workshop on Preparing for Nuclear Arms Reductions to Address Technical Transparency and Verification Challenges

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ABSTRACT
In May 2011, an INMM workshop was held to develop broader awareness of the technical and operational challenges that could be used to enhance effective transparency and/or verification in the medium to long-term. Building confidence in a broader multi-lateral engagement scenario adds even greater challenges than the traditional bi-lateral approaches. The multi-disciplinary group that attended included decision-makers needing to understand present and possible future technical capabilities, and the technical community needing clearer definition of possible requirements and operational constraints. The group conducted an exercise to stimulate new perspectives on verification requirements for a scenario based on nuclear arms reductions at very low numbers of nuclear weapons. This presentation will summarize the outcome of the workshop and anticipated follow-on efforts.

INTRODUCTION
In Prague on April 5, 2009, President Barak Obama "... state[d] clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons. I'm not naive. This goal will not be reached quickly –- perhaps not in my lifetime. It will take patience and persistence." As governments grapple with the defense and foreign policy decisions that must be taken to work towards the long-term goal of nuclear arms reductions, professional societies, such as the Institute of Nuclear Materials Management, have initiated forums to bring together technology developers, defense/foreign policy experts and students to develop and explore ways to achieve this challenging objective.

In close cooperation with the James Martin Center for Nonproliferation Studies (CNS) at the Monterey Institute of International Studies (MIIS), the Lawrence Livermore National Laboratory, and the INMM's Nonproliferation and Arms Control Technical Division a workshop was organized to:

- To consider government perspectives and results of a recent National Academy of Sciences (NAS)/United States Institute of Peace Symposium (USIP),
- Focus on technical challenges related to achieving greater transparency and verification of compliance with future commitments, and
- Conduct an exercise to challenge participants to think about what would be required to move towards a word with "zero" nuclear weapons.

OVERVIEW OF PRESENTATIONS

During the first session of the workshop, United States and United Kingdom representatives spoke about their government's views on exploring options for future nuclear weapons stockpile reductions. They stressed the important capability that technology provides to monitor and verify commitments related to nuclear testing, accountability of warhead numbers/locations, possible future weapons dismantlement programs, and the production disposition of fissile materials for use in nuclear weapons. Existing and evolving technologies can help governments move towards these desired policy objectives so a robust dialogue between the technical and policy communities is essential. It was also recognized that engagement must extend beyond U.S.-Russia to other nuclear weapons states (P-5), de-factor weapons states, non-nuclear weapons states, and NATO.

A nuclear security symposium, in January 2011, organized by the National Academy of Science Committee on International Security and Arms Control (CISAC) and USIP, asked experts from U.S. and Russia to draw lessons from the past and consider what could be accomplished today and in the future. By focusing on science diplomacy in support of nuclear security, they emphasized how science can bridge distrust and work to build meaningful confidence measures between countries. Past efforts, such as the U.S-Russia Joint Verification Experiments (JVE) explored how sensitive national security information could be protected while finding ways to monitor the other side's nuclear tests under the Threshold Test Ban Treaty. In this way, bi-lateral technical cooperation in support of verification was used to build trust.

Following presentations expanded on the importance of scientific and technical cooperation by raising past verification technology cooperation for the Intermediate Range Nuclear Forces (INF) Treaty and the Comprehensive Nuclear Test Ban Treaty (CTBT). Participants noted additional cooperative programs, not necessarily aimed at a specific treaty, that kept technical experts working together on a broad range of national security topics. The U.S. – Russia Warhead Safety and Security Exchange (WSSX), U.S-U.K. cooperation, and U.S.-China cooperation on materials protection, control and accounting were cited as examples. The most successful technical efforts focused on problems to develop common approaches, exercising sound scientific principles, and as much as possible, shielding the work from political pressures.

More details were presented on technical work that aided in the development of the CTBT global Radionuclide Monitoring Network (part of the International Monitoring System) and the CTBT On-Site Inspection regime. Experts illustrated how scientists working in a creative environment could cooperate and effectively communicate the results of their work to the policy community for implementation.

Two speakers addressed practical aspects of implementing verification regimes by drawing on U.S. and Russian experiences to implement Strategic Arms Reductions Treaty (START) on-site inspections and a more recent U.K.- Norway initiative to explore verification of nuclear warhead dismantlement between a nuclear weapons

state (NWS) and a non-nuclear weapons state (NNWS). In both cases, a clear understanding of the treaty/policy requirements was needed for successful implementation of the inspections. The tension between protecting the inspected party's sensitive information while allowing sufficient access to provide the inspecting party with confidence that their objective has been achieved was clearly illustrated, and ways to overcome this tension were explored.

The workshop participants were reminded that hosting an inspection is a disruptive event and must be efficiently run with fully functioning equipment. The health and safety of the inspectors must also be considered. It was stressed that in many cases, the simplest equipment might be the best option but if specialized equipment is needed, jointly developed systems provide the highest confidence that access to sensitive information has been controlled and the measurement results are accurate. The START inspectors benefited from 10 years of on-the-ground experience and the experience will be carried forward to the New START inspection regime. The U.K.-Norway Initiative illustrated how the dialogue between sides is crucial in understanding the complexities of bi-lateral work between a NWS and NNWS. The U.K-Norway Initiative went one step beyond NWS-NNWS engagement and looked at the advantages and disadvantages of engaging the public via a trusted observer (in this case a non-governmental organization). They reported that this was useful in establishing a constructive dialogue.

The final session, set out to outline the possible steps to be taken as the world moves from the current nuclear weapons stockpiles levels held by the P-5 to lower levels taking into account existing and potential Indian, Pakistani, Israeli, DPRK and Iranian weapons. The session highlighted the premise that, as the number of weapons decrease, the cost and intrusiveness of each successive treaty will increase and new authorities and technological approaches will be required. The challenges inherent in accepting an increased level of intrusiveness and the need to verify declarations will have to be taken into account. Additionally, national defense linkages to conventional weapons cannot be ignored as the number of weapons gets lower and lower.

Technical presentations addressed the anticipated difficulties in protecting sensitive information collected during nuclear warhead measurements and consideration for designing information barriers to protect such information. Significant challenges would be encountered if a treaty required chain of custody and accounting of warheads throughout the lifecycle of nuclear operations.

EXERCISE

Keeping in mind the challenges that were outlined during the day, the workshop participants were divided into two groups, facilitated by CNS professors, and asked to explore the political and technical requirements need for States to move towards significant arms reductions. Using a technique called "backcasting," participants were asked to imagine a world without nuclear weapons and describe what would be needed to achieve levels of one thousand, one hundred, ten, and ultimately zero

weapons in the world. The objective was never to convince the participants that a world without nuclear weapons would be achievable in the near future but to encourage thinking about the provisions that would needed to verify such a world. Although many participants could not accept the reality of "zero" nuclear weapons, a lively discussion ensured. As the discussion evolved, they were documented on boards as shown. An example is shown in Figure 1.

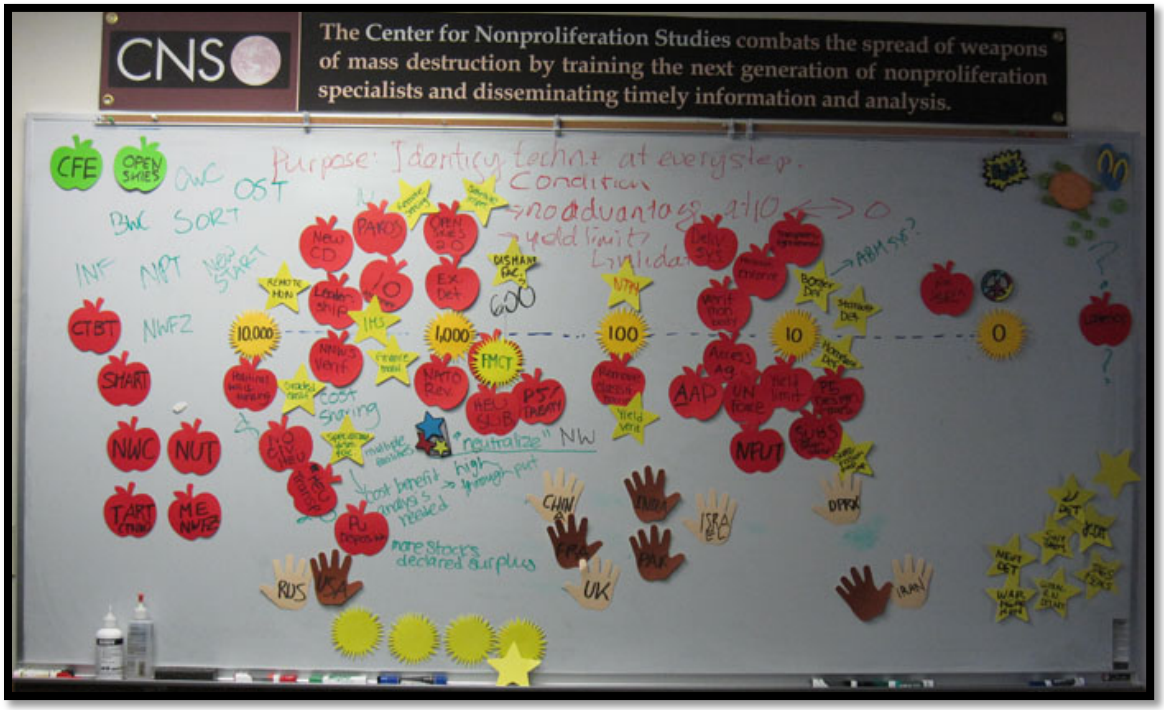

Figure 1: Group A Exercise results

Although the results look quite different, the groups converged on a few common themes:

- For "global zero" to be achieved, the political, military, and social environment must achieve a state where nuclear weapons are no longer desirable. Sustained leadership and consensus will be needed.
- Russia-U.S. engagement on arms reductions will be a priority early on, then the importance of P-5 engagement will increase. As the world moves closer to 100 weapons, engaging the other states with nuclear weapons will become more important.
- Technology and methodologies are important but less than political, military and social factors. It is not possible for us to know all the transparency and verification tools that will be needed in the future, however, both groups recognized that a full range of technologies will be needed to detect highly enriched uranium and plutonium, monitor remotely, implement effective warhead chain of custody, and authenticate measurements and signals.
- The groups focused on the era of moving from 1000 and then to 100 weapons. This was viewed as a time period of great instability and agreed that more

measures would be needed to increase transparency and build confidence.

- As we move to "zero," dealing with dual-use and latent capabilities together with the need to control any release of sensitive national security or weapons significant information will greatly complicate the process.
- Controlling fissile materials for use in nuclear weapons, such as with a Fissile Material Cut-off Treaty, was important if we were to try to move lower than 1000 nuclear weapons, because nuclear materials could be a direct route to reconstitution of weapons.
- Both groups discussed nuclear weapon dismantlement requirements. One group emphasized the need to be able to accelerate the throughput of dismantlement because a large backlog of weapons designated for dismantlement would increase instability. In an unstable environment, it is unlikely that states would agree to further reduce their nuclear weapons stockpiles.

CONCLUSIONS

An INMM workshop to address technical transparency and verification challenges in preparing for nuclear arms reductions brought together about 70 international multi-disciplinary experts from government, international organizations, non-governmental organizations, national laboratories, industry, and academia. The mix of policy and technology experts, together with students resulted in lively discussions and the group was motivated to explore various options, and identify obstacles and technology challenges. Student participation allowed engagement between those embarking on their careers with those who have had decades of experience working on nuclear weapons issues. The presentation materials will be available on the INMM website and ideas for follow-on workshops and studies are being explored.

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