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The Role of Cooperative Monitoring in Regional Security[1]

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This article is the first in a series of contributions to *Force* from the Cooperative Monitoring Center (CMC) at Sandia National Laboratories in New Mexico, USA, on technologies for cooperatively monitoring international agreements. The CMC was established in 1994 as part of Sandia's International Security Programs that conduct research, training, and implementation of monitoring projects to demonstrate the role of technology in enabling international cooperation and reducing threats. This cooperation may include formal agreements on arms control, regional stability, or nonproliferation as well as less formal confidence building measures. The United States Department of Energy and its National Nuclear Security Administration are the primary sponsors of this work.

The forthcoming series of articles will outline basic concepts for cooperation using technology to promote confidence building and implementation of bilateral, multilateral and international security agreements. They will also explain the principles behind some of the technologies and highlight studies that explore options for the use of such technologies in South Asia and/or other regional settings. The goal will be to provide common understanding and to stimulate thinking about the role of technology in contributing to the resolution of international security problems.

For many years, technology has played a major role in the development and implementation of international security policy. Policy-makers depend on technical experts for advice on the verifiability of potential treaties, as well as for developing technical approaches to monitoring complex new agreements. The availability of new technology expands the options available to policy makers, and influences the evolution of security policy. These lessons, many of which have been learned in the US-Russia context, have applicability in other geopolitical settings such as South Asia. International cooperation on these technical issues is vital to the successful implementation of agreements in support of policy objectives. Applications for the use of such technologies span a range of issues from controlling and protecting nuclear materials, to stabilizing conventional military threats, and enhancing prospects for environmental cooperation.

Cooperative monitoring is defined as obtaining and sharing agreed information among parties to an agreement. It includes the use of shared technologies for data collection, the sharing of information collected, and the establishment of peaceful means for dispute resolution. Cooperative monitoring is not a substitute for other national means of

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unilateral data collection, but rather a supplement to them that may provide more complete information and also build confidence between or among nations.

A systems approach to monitoring includes the integration of multiple technologies to solve specific problems. This may include multiple sensor systems for detection as well as the integration of sensors with communication, data security, and information management technologies. System design needs to begin with a definition of the threat and understanding of system objectives. Effective systems also need to account for issues such as climate, terrain, costs, manpower, and the impact on other operations. Technologies used in support of physical protection systems include not only monitoring systems to detect activities but also systems to delay an adversary, and to respond to the threat.

Historically, technology has played an increasingly cooperative role in the implementation of agreements. There has been a progression from unilateral use of technology for monitoring to bilateral and multilateral efforts. In the first arms control agreements between the United States and the Soviet Union, each country relied on its own national technical means (NTM) for verification. More complex treaties required a more intrusive approach. On-site inspections and monitoring became accepted components of verification, and were negotiated as part of the treaty itself. In the 1970's monitoring played a key role in the agreements between Israel and Egypt that permitted disengagement in the Sinai Peninsula. At the same time, multilateral treaties led to the formation of international inspectorates that were given the responsibility of carrying out verification activities, and that set their own technical requirements.

By the 1990s, the security of nuclear material and weapons in the former Soviet Union (FSU), particularly Russia, became a high priority. Recognizing that the problem could not be solved by one country alone, the United States and Russia launched a new era of cooperation to develop and deploy technical systems to prevent the theft of nuclear material in Russia. They also developed and implemented technical options to increase the safety and security of nuclear weapons, and to monitor agreements for the disposition of excess nuclear materials resulting from dismantled nuclear weapons. Technical collaborations were initiated to support conversion of the Russian defense complex from military to peaceful purposes, particularly the creation of government/commercial partnerships to provide employment for former nuclear weapon scientists. Monitoring options for possible future agreements were also explored. This cooperative approach, which has proven critical to solving common problems, is now being applied in other countries as well.

The challenges of regional security, nonproliferation and counter-terrorism are intimately linked. For example, in addressing nuclear, biological or chemical proliferation, it is not enough to focus only on protecting material at its site of origin. Detection of illicit smuggling at borders and ports is needed along with establishing employment opportunities for scientists and engineers who could carry their knowledge to other countries. Reducing the motivation to acquire or use such weapons is also important.

As a part of its international security work, Sandia has established a Technology, Training and Demonstration Area to showcase concepts and technology that have been developed by the US national laboratories, other government agencies, international organizations, and by private industry. None are classified, and many are commercially available. They include historical as well as current approaches to the use of technology in supporting international security agreements. These technologies have been utilized to monitor treaties, such as those between the United States and the former Soviet Union, to support international organizations such as the International Atomic Energy Agency (IAEA), and to address the new global challenges of combating international terrorism and improving regional security in South Asia and elsewhere. Selected examples of relevant technologies are listed below. These and other topics will be the subject of future articles.

Remote Sensing

Remote sensing consists of monitoring at a distance from the areas of interest. Satellite and aerial monitoring are examples. Satellite monitoring is generally unilateral since no cooperation with others is required to gather data from satellite sensors. However, cooperation may exist in sharing information or collaborating in the analysis of data. Satellites may include optical, radar or thermal infrared sensors at a variety of resolutions. Satellites have been used to monitor nuclear testing, to assess development activities, troop deployments, or environmental conditions. Resolution of commercial satellite images has continued to increase. Optical imagery at less than 1 meter resolution has become routinely available.

Aerial monitoring can provide higher resolution and longer times over the areas of interest. However, aerial monitoring generally requires cooperation in order to fly over the territory of another state. Multilateral agreements, such as the Open Skies Treaty, involve jointly operated missions among participating countries. Similar sensor systems to those of satellites are available along with the addition of air sampling capabilities.

Ground Sensors

Families of ground sensors exist that detect everything from ground motion to the thermal characteristics of people or vehicles. Examples include technologies to measure seismic, infrared, magnetic, radar and other responses. They may be buried in the ground, mounted on fences, or positioned to scan a broad area. These sensors often transmit data by radio frequency to fixed or portable receivers where operators can assess the system alarms. These systems have application for perimeter monitoring around facilities, chokepoint monitoring along roads or pathways, or over long distances such as along a border. Another application for seismic monitoring, in which ground motion is measured, is in the detection of underground nuclear testing. Regional cooperation on seismic monitoring can also have benefits in better characterizing earthquake activity while providing a forum for scientific collaboration.

Video Monitoring

Video surveillance permits assessment and characterization of other sensor alarms by providing a picture what is being detected. It has application for monitoring facilities,

borders, and perimeters. For example it has been an important tool used extensively to monitor nuclear materials and facilities by the International Atomic Energy Agency (IAEA) in implementing Safeguards Agreements to assure that civil nuclear material is not diverted to weapon programs.

Facility Monitoring and On-Site Inspection
The use of technology to monitor activities within a facility can be an important element of treaty verification or confidence building. Technologies to control access, detect and characterize motion, and detect tampering with stored assets are all utilized. Permitting inspections of sensitive facilities with appropriate technology may also be a necessary step in building confidence and determining compliance with agreements.

Other Technologies
A wide range of other technologies and analytical tools exist to apply to the security topics being discussed. Border security, infrastructure security, biological nonproliferation, and environmental security are critical new areas for international cooperation in which technology can play an important role.

A comprehensive systems view of security has been essential in developing technical options for implementing security policies. Working with countries to develop technical options to implement regional agreements or to address legitimate security concerns is an important element of security policy.