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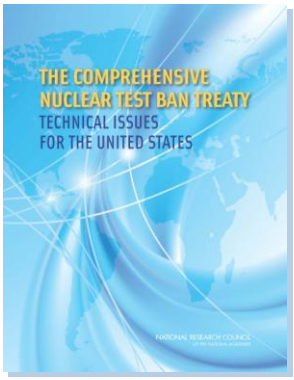
REPORT IN BRIEF




# THE COMPREHENSIVE NUCLEAR TEST BAN TREATY
## TECHNICAL ISSUES FOR THE UNITED STATES (2012)

This report reviews and updates the 2002 National Research Council report, *Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty* (CTBT). The committee was asked to assess:

- plans to maintain the safety and reliability of the U.S. nuclear stockpile without nuclear-explosion testing;
- the U.S. capability to detect, locate, and identify nuclear explosions;
- commitments necessary to sustain the stockpile and the U.S. and international monitoring systems; and
- potential technical advances countries could achieve through evasive testing and unconstrained testing.

Provided that sufficient resources and a national commitment to stockpile stewardship are in place, the committee judges that the United States has the technical capabilities to maintain a safe, secure, and reliable stockpile of nuclear weapons into the foreseeable future without nuclear-explosion testing. The Administration, in concert with Congress, should formulate and implement a comprehensive plan that provides a clear vision and strategy for maintaining the nation's nuclear deterrence capabilities and competencies, as recommended in the 2010 Nuclear Posture Review and related studies. Sustaining these technical capabilities will require action by the National Nuclear Security Administration, with the support of others, on at least the following elements:

- a strong scientific and engineering base maintained through a continuing dynamic of experiments
  linked with analysis;
- a vigorous surveillance program;
- adequate ratio of performance margins to uncertainties;
- modernized production facilities; and
- a competent and capable workforce with a broad base of nuclear security expertise.

The United States has technical capabilities to monitor nuclear explosions in four environments—underground, underwater, in the atmosphere and in space. Technical capabilities have improved significantly in the past decade, although some operational capabilities are at risk. Seismology, the most effective approach for monitoring underground nuclear-explosion testing (the environment in which all known nuclear-explosion tests have been conducted since 1980), now provides much more sensitive detection, identification, and location of explosions. Most of the seismic stations of the International Monitoring System (IMS) under the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) are operating now, and the 90 percent confidence levels for IMS seismic detection are well below 1 kiloton (kt)

worldwide for fully coupled explosions. With the inclusion of regional monitoring and improved understanding of backgrounds, an evasive tester in Asia, Europe, North Africa, or North America would need to restrict device yield to levels below 1 kt (even if the explosion were fully decoupled) to ensure no more than a 10 percent probability of detection by the IMS.

The United States' global monitoring capabilities, or national technical means (NTM), provide monitoring capability that is superior to that of the IMS and can focus on monitoring countries of concern to the United States. However, the IMS provides valuable data to the United States, both as an augmentation to the U.S. NTM and as a common baseline for international assessment and discussion of potential violations when the United States does not wish to share NTM data. Thus, the United States should support both the completion of the IMS and its operations, training and maintenance, whether or not the CTBT enters into force.

Constraints placed on nuclear-explosion testing by the monitoring capabilities of the IMS, and the better capabilities of the U.S. NTM, will reduce the likelihood of successful clandestine nuclear-explosion testing, and inhibit the development of new types of strategic nuclear weapons. The development of weapons with lower capabilities, such as those that might pose a local or regional threat, or that might be used in local battlefield scenarios, is possible with or without the CTBT for countries of different levels of nuclear sophistication. However, such developments would not require the United States to return to testing in order to respond because it already has—or could produce—weapons of equal or greater capability based on its own nuclear-explosion test history. Thus, while such threats are of great concern, the United States would be able to respond to them as effectively whether or not the CTBT were in force.

A technical need for a return to nuclear-explosion testing would be most plausible if the United States were to determine that adversarial nuclear activities required the development of weapon types not previously tested. In such a situation, the United States could invoke the supreme national interest clause and withdraw from the CTBT.

As long as the United States sustains its technical competency, and actively engages its nuclear scientists and other expert analysts in monitoring, assessing, and projecting possible adversarial activities, it will retain effective protection against technical surprises. This conclusion holds whether or not the United States accepts the formal constraints of the CTBT.

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**FOR MORE INFORMATION** on the project, contact Benjamin Rusek at 202-334-3975 or visit the Policy and Global Affairs website at http://sites.nationalacademies.org/pga. Copies of *The Comprehensive Nuclear Test Ban Treaty: Technical Issues for the United States* are available from the National Academies Press; call (888) 624-8373 or (202) 334-3313 (in the Washington metropolitan area), or visit the NAP website at www.nap.edu.