
Chapter 2: Verification

The underlying rationale for reaching an arms control agreement is simple: by virtue of being similarly restrained in weapons testing or deployment, all assenting states expect to gain national security benefits. The actual realization of the anticipated benefits depends on each signatory being in compliance with the terms of the agreement. Since treaty violations by even one signatory could threaten the national security of others, a demonstrable capability for monitoring treaty compliance and detecting violations, if they occur, becomes vitally important.

At present, and for the conceivable future, it is not practically possible to detect with a high level of confidence a very small underground nuclear explosion that takes place at an arbitrary location away from declared test sites. This would be especially true for a test which employs a deliberate evasion scheme, such as seismic decoupling — that is, the use of a cavity to achieve a reduction in strength of the seismic signals leaving the source region.

On the other hand, it is important to consider the military significance of nuclear tests at very low yields. The most crucial part of a modern thermonuclear warhead is called the primary, or fission trigger. Most primaries have yields between 5 and 15 kilotons. The threshold for the physical processes that make small primaries possible (boosting) is about one kiloton or a bit larger. It is generally believed that nuclear testing at a yield level much below one kiloton is not militarily significant.

Verification serves three principal purposes: a) confidence building; b) detection of treaty violation; and c) deterrence to potential treaty violation. Deterrence can result because a small (e.g. 0.5 kiloton) clandestine nuclear test *may* be detected and identified. Moreover, the chances of getting caught cheating increase with the explosion yield.

Nevertheless, because it is not possible to detect and identify all nuclear tests using forensic seismology, views on what constitutes adequate and effective verification differ. In large measure, the desired degree of confidence in verifying compliance with a low threshold test ban depends on one's perception of whether the benefits of an agreement outweigh the potential risks of treaty violation by the other signatories.

Though they provide the primary means of test ban treaty verification, seismic methods can be made more effective when supplemented by treaty provisions for on-site inspections and the use of "national technical means" (NTM). Thus, a package of mutually reinforcing monitoring methodologies —