

The official U.S. network of seismic, electromagnetic, and acoustic sensors, the Atomic Explosion Detection System (AEDS), has been operating 23 stations around the Soviet Union for over 30 years, and some observers believe it can detect explosions as low as 10 kilotons. The Conference on Disarmament's Group of Scientific Experts (GSE), created in 1976 to "consider and report on international cooperative measures to detect and identify seismic events," has carried out two major experiments to test methods for international collection, analysis, and exchange of detailed seismic data in an effort to determine the operational requirements for a global seismic network. There are over 10,000 seismic stations around the world at the present time, most of which are affiliated with mining companies and universities. In-country seismology, combined with data about the geology of the country — as called for in the TTBT — markedly improves the ability of signatories to testing treaties to monitor tests.

The yield of an underground nuclear explosion may also be estimated using hydrodynamic methods which make use of the fact that larger explosions create shock waves that expand faster than the shock waves created by smaller explosions. Several techniques have been used to measure the position of the shock front as a function of time, the most recent being the technique called CORTEX (an acronym for Continuous Reflectometry for Radius versus Time Experiments).

Hydrodynamic yield estimation methods are more intrusive than remote seismic methods. Personnel from the monitoring country must be present at the test site of the testing country well before and during each test; the presence of these personnel observing test preparations poses some operational security problems. The exterior of the canister containing the nuclear charge and diagnostic equipment must be examined to verify that the restrictions necessary for the yield estimate to be valid are satisfied; for tests of nuclear directed energy weapons, this examination could reveal sensitive design information unless special procedures are followed.

Sensing cables and electrical equipment tend to pick up the electromagnetic pulse (EMP) generated by the explosion; a detailed analysis of the EMP could reveal sensitive information about the design and performance of the nuclear device being tested.

Well-coupled nuclear explosions could be detected and identified with high confidence down to yields well below 1 kiloton using a high-quality seismic network. However, certain evasion schemes of countries attempting to conduct clandestine tests can be identified, for example, testing behind the sun or in deep space, simulating an earthquake, testing during an earthquake, testing in a large underground cavity (decoupling), testing in a nonspherical cavity, testing in low-coupling materials, or masking a test with a large chemical explosion. These scenarios need to be countered by a combination of seismic methods, treaty constraints, and other monitoring methods. Treaty constraints which have been proposed to improve the capability of various monitoring networks include the following: limitations on salvo-fired chemical explosions; limitations on ripple-fired chemical explosions; limitations to one inspected and calibrated test site; on-going test site inspections; joint on-site inspections of sites of possible violations which could be evident from chemical residues; and country-wide network calibration tests.

The Limited Test Ban Treaty (LTBT) of 1963 prohibits nuclear weapon tests in the atmosphere, outer space, and under water. It is verified by NTM which includes VELA satellites and air-sampling by aircraft outside the territory of the original parties. These verification capabilities would be applied to a moratorium and a CTB.

Strengthening the MTCR

The Missile Technology Control Regime (MTCR) is a voluntary arrangement among countries — it now has 22 members — sharing a common interest in arresting missile proliferation. The regime consists of guidelines for exports and an annex listing items subject to

