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B R I E F

The CTBT: Verification and Deterrence

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Little is seemingly written about the relationship between verification and deterrence in arms control and disarmament treaties and agreements. This might seem a shade theological, but deterring non-compliance is perhaps one of the core objectives of any treaty verification regime and states parties must have confidence that this goal can be achieved. Exactly what deters in deterrence may be unknown and perhaps difficult to define. We can however consider that any state contemplating a clandestine programme, or in this case one or more underground nuclear tests, must make certain calculations about its ability to conceal all of the evidence all of the time from a watchful international community.

Balancing risks—military and strategic gains against the political, diplomatic and economic costs—is not easy. A potential violator has to be sure that his preparations to test, as well as its conduct and aftermath, can be concealed from the international community indefinitely. In the case of the CTBT, it will be a combination of national technical means (NTMs) and the treaty's International Monitoring System (IMS) and on-site inspections that place a series of high hurdles in the face of a would-be proliferator. Tripping over just one can compromise his plans and negate any conceivable military advantage that he might have been hoping to derive from a clandestine test, or tests.

It is worth recalling here that Sir William Penney, the leader of the UK's nuclear weapons programme in the 1950s and early 1960s, advised Harold Macmillan's government in 1962 that even though the Soviet Union might be confident in avoiding the detection of one test under the then envisaged verification system, it could not be at all sure that a series of, say, three tests would go unnoticed. Penney's view was that one test would not alter the strategic balance and so the risk of a test ban treaty was worth taking as one would need a series of tests to obtain a strategically significant advantage.

More than fifty years later we have the CTBT's IMS, which, as of August 2011, has 86 per cent of its primary stations (including seismic, hydroacoustic, infrasound and radionuclide stations), 83 per cent of its auxiliary seismic stations and 63 per cent of its radionuclide laboratories certified. Their detection capabilities are immeasurably superior to those planned by the 1958 Geneva seismic experts' meeting. Simulations of global detection thresholds today, measured in terms of equivalent nuclear-yield in kilotons of TNT (kt), suggest that the IMS network is capable of detecting and identifying, worldwide, explosions fired close-coupled underground in hard rock, in the atmosphere, and in the ocean, with a yield equal to or more than one kiloton. In many areas of the world, such as continental Eurasia, the detection threshold is significantly less than one kiloton. In the 1977–1980 Tripartite Test Ban Treaty negotiations, UK and US scientists took the view that it would only be yields of around ten kilotons that would permit meaningful developments in new warhead design.

Any state contemplating a clandestine test has to be sure that, even assuming its preparations go undetected (it can take about a year to prepare for an underground test), it still must find the right geological conditions on its territory in a reasonably remote area. It has to be sure, too, that it can stem a borehole or tunnel effectively to guarantee no venting of radioactive particles or radioactive noble gases that could be picked up by IMS radionuclide stations. Such a task would be challenging for a state with no prior experience of underground testing.

Then there is the small matter of the seismic stations—primary and auxiliary—detecting the event and the strong likelihood that it will be subsequently correctly identified as an explosion from the Treaty's International Data Centre (IDC) Reviewed Events Bulletin. How convincing an explanation could a state provide when pressed for clarification under the Treaty's Article IV provisions? Could it be absolutely confident that it could conjure up a fool-proof cover story that would hoodwink all of the treaty's states parties?

This is where we first begin to see that the more effective the verification system and the greater the integration of the elements that combine to make it up, the greater the level of deterrence of non-compliance is. A regime that can demonstrate a very high level of technical reliability, coverage and sensitivity presents a formidable obstacle to anyone who wants to cheat. The IMS does that.

A state might hope that the CTBT Organisation's Executive Council would fail to act on the compelling evidence presented by the IDC as well as any supporting information from states parties NTMs and other sources (such as commercial satellite data) and vote against an on-site inspection. However, could any state guarantee that this would indeed be the case? Just how confident ahead of time could it be? As Tibor Toth—the Provisional Technical Secretariat (PTS) Executive Secretary—has pointed out, the very nature of the Treaty's verification regime will be democratic in that the information behind an inspection request is derived from an independent system whose results are open to all states parties. There may, therefore, be very strong pressures to respond to a well-substantiated compliance concern, which it would be politically much more difficult to ignore or dismiss.

Building an on-site inspection capability for the CTBT is a demanding and lengthy process—but such a capability provides the one clear way of confirming that an event that triggered an inspection was a nuclear test conducted in violation of the treaty's Article I prohibitions. Effective inspections require a well-equipped,

trained and experienced cadre of inspectors and an ability to deploy to the field promptly. If the future Technical Secretariat cannot meet these criteria then the OSI regime is a paper tiger.

However, major strides have been taken by the PTS and some states signatories in recent years and efforts are continuing on building up an initial capability that would be fit for purpose on entry-into-force of the treaty. There will be a large-scale OSI exercise Integrated Field Exercise in 2014 that will be a key milestone in the development of the Treaty's OSI regime. OSIs present a violator with an array of techniques and technologies that will make it immensely difficult to be sure that absolutely all incriminating traces of illegal activity can be concealed for up to the 130 days that an inspection could last.

Deployment of these techniques and technologies in an integrated and intelligent manner provides a potent tool for detecting non-compliance. And, if the traces cannot be concealed, finding sustainable and convincing technical explanations that will persuade not just the inspectors but the Executive Council back in Vienna is no easy matter. The Council will review the final inspection report and determine whether any non-compliance has occurred.

Knowing that the treaty's OSI capability is effective and would stand a very good chance of uncovering facts strongly suggestive of non-compliance, a cheating state will have to obstruct the inspectors in the field. A systematic pattern of evasion, delay, obstruction, obfuscation and down-right hostility tells its own story, especially since inspectors are allowed to comment on the co-operation (or lack thereof) provided by an Inspected State Party in their final inspection report.

Even a remote chance of detection is a difficult thing for a would-be violator to guard against. Moreover, the greater the level of uncertainty in the mind of such a state, the greater the role that OSIs play in the deterrent effect of the treaty's overall verification regime. During the 1977–1980 tripartite test ban treaty negotiations the UK noted that:

> *'There is no known remote method of determining unambiguously whether an underground event was man-made in origin and, if so, was due to a nuclear explosion. Such conclusive evidence is only obtainable by an on-the-spot investigation into the presence of radioactive materials. Provision for OSI would help deter clandestine testing by posing a threat that it would be identified as such; OSI would also enhance the confidence of all parties to the treaty that its provisions were being observed.'*[1]

This statement remains valid today.

The CTBT verification regime—comprising the IMS stations (i.e. primary seismic, auxiliary seismic, hyrdoacoustic, infrasound and radionuclide, including stations with radioactive noble gas detection capabilities), the International Data Centre, National Data Centres, consultations and clarification procedures and on-site inspections armed with an array of detection techniques and technologies—presents a formidable set of obstacles for a would-be violator to surmount. And in this equation we should not overlook the role that can be played by NTMs—remote sensing data such as multispectral and infrared images to give but one example.

Nor should we forget that science and technology does not stand still and we can confidently expect that the capabilities of all aspects of the verification regime will increase. In particular, as the June 2011 Science and Technology for the CTBT Conference in Vienna noted, progress in sensors, networks and observational technologies as well as in computing and processing offer promising benefits for the efficacy of all components of the treaty's verification regime.

We might still not know exactly what deters in deterrence in the context of preventing non-compliance in arms control and disarmament agreements, but in the context of the CTBT the negotiators designed an integrated system that will clearly complicate the plans of any state thinking that it could evade that system successfully and derive a meaningful political, military or strategic advantage from doing so. The overall regime must inevitably impact on the calculations of a would-be evader, and the higher the assurance of detection the more uncertain he must be that he can get away with cheating. Deterrence of non-compliance is therefore strengthened.

Endnotes

1. The National Archives, CAB 130/952 GEN 63 (77)18 Comprehensive Test Ban Treaty Negotiations: Verification Note by the Secretary 25 November 1977 Annex para. 8 pp 9–10.

Dr John R. Walker has worked in the UK Foreign and Commonwealth Office's Arms Control and Disarmament Research Unit (ACDRU) since March 1985. He currently focuses on Chemical Weapons Convention (CWC), Biological and Toxin Weapons Convention (BTWC) Comprehensive Nuclear Test Ban Treaty (CTBT) issues and arms control verification more generally. He has been a member of UK delegations at BTWC and CWC Review Conferences, the BTWC Ad Hoc Group, CWC Preparatory Commission Expert Groups and CTBTO Preparatory Commission Working Group B meetings on on-site inspection issues.

Dr Walker has published widely on aspects of CBW history in the Harvard-Sussex Program's 'The CBW Conventions Bulletin'. His book 'British Nuclear Weapons and the Test Ban 1954–1973' was published in November 2010. His second book, 'Britain and Disarmament: The UK and Nuclear, Biological and Chemical Weapons Arms Control and Programmes 1956–1975' will be published by Ashgate in February 2012.

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About this paper

This brief, by Dr John R. Walker, looks at the capabilities of the CTBT's verification regime and the role of that regime in deterring clandestine nuclear testing. Dr Walker argues that in the context of CTBT verification, negotiators designed an integrated system that will clearly complicate the plans of any state thinking that it could evade that system and derive a meaningful political, military or strategic advantage from doing so. He writes that the treaty's verification 'presents a formidable set of obstacles for a would-be violator to surmount.' That in turn, Dr Walker argues, plays an important role in deterring parties from attempting to evade the treaty in the first place.

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