TITLE: OSI and Arms Control Monitoring

AUTHOR: (b)(3)(c)

VOLUME: 35 ISSUE: Summer YEAR: 1991

Approved for Release: 2014/07/29 C00624364

STUDIES IN INTELLIGENCE

A collection of articles on the historical, operational, doctrinal, and theoretical aspects of intelligence.

A formidable task

OSI and Arms Control Monitoring

A new age of arms control treaty implementation has been ushered in by the on-site inspection (OSI) associated with the Intermediate Nuclear Forces (INF) Treaty, the Threshold Test Ban Treaty (TTBT), the Treaty on Conventional Forces in Europe (CFE), and, most recenty, the Strategic Arms Reduction Treaty (START). There is, furthermore, a bilateral chemical weapons agreement with the Soviets to be implemented, and some prospect for the multilateral Chemical Weapons Convention to be concluded next year. These also contain provisions for OSI.

In the early 1980s, there was little expectation within the US administration that the USSR would ever accept OSI provisions. Previously, the US had proposed OSI as early as the 1960s, when nuclear testing limitations were first being negotiated, resulting in the characteristic Soviet refusal. Except for the Peaceful Nuclear Explosions Treaty of 1976, the Soviets had consistently refused to agree to any on-site activity.

In the late 1980s, as with so much else in the USSR and Eastern Europe within the past few years, the situation suddenly changed. Moscow accepted OSI across the board, and negotiations began in earnest. To a large extent, the US was taken by surprise. Having fully expected the USSR to maintain its historic posture and continue to refuse OSI, the US was not ready to specify its detailed requirements and modalities for OSI. Indeed, it did not understand all the implications of OSI. The Soviets were even less prepared; they looked to the US to provide all the initial draft language upon which negotiations would be based. Consequently, even though the general OSI concept has been around for almost 30 years, a lot of new ground had to be broken in a short time. This process continues even today. Each new treaty has its own peculiarities, and so for each treaty new ways have to be discovered to implement OSI and to use OSI information.

Two Kinds of OSI

OSI refers to all activities performed by the inspecting or verifying party, say the US, in the inspected or host country, say the USSR. There are, however, two distinct kinds of OSI. There is inspection of declared activities and facilities, and there is inspection of undeclared facilities, also called suspect site or challenge inspection. Declared-site inspections can occur only at places identified ahead of time by the treaty parties. These are the only kind of inspections allowed in the INF and TTB treaties. The concept of challenge inspection, to allow access to non-declared sites where prohibited activities may be taking place, is contained in the CFE treaty, and it is being negotiated in other treaties.

Advance notice of inspection has to be given in all cases. The amount of advance notice may vary from one treaty to another, but the inspected party will always know ahead of time when and where the inspection team will arrive, how long it will stay, and what the inspection procedures will be. Moreover, the inspected party is responsible for providing the transportation for the inspection team from the point of entry to the inspection site. This gives the inspected party considerable opportunity to prepare the site for inspection, and, in extreme cases, to delay or prevent arrival of the inspection team. Of course, such actions would be "cause for concern." They would be discussed in the consultative body associated with each treaty, and they could possibly result in a *demarche*. But they can be attributed to bad weather, faulty equipment, or human error, and there can be no doubt that the inevitable protest would be viewed by the inspected party as preferable to the "smoking gun" detection of an actual treaty violation.

OSI is expensive, and so it is fair to ask the fundamental question, "What good is OSI?" An argument has been made that there is little likelihood of a treaty party trying to cheat at an inspection site while inspectors are present. If one believes this statement, it follows that there is little that OSI can do to help catch cheating, because such cheating presumably would be taking place somewhere or at some time when inspectors are not present.

OSI is often called a "confidence-building measure" (CBM), meaning that if the inspections demonstrate that one side is accurately providing information about the inspected sites, then the other side has some increased confidence that the provisions of the treaty are being observed. CBMs probably provide some political benefit.

Leaving political value aside, the intelligence question to be asked is, "How much, if at all, does OSI improve treaty monitoring?" Some qualitative value for National Technical Means (NTM) can be expected from OSI in all treaties from the added information that may help us better use the data from intelligence sources. In only the TTBT treaty, however, can a quantitative improvement of NTM be readily determined. It may be that only the TTBT offers the opportunity for such improvement.

The TTBT

In the TTBT and its associated Joint Verification Experiment (JVE), the inspectors have the opportunity to acquire fundamental data about the geology at the nuclear test site and also to measure the yield of the nuclear explosion more accurately than ever before. Besides providing direct yield estimates, these data tell quite a bit about how the observed explosion, or any other past or future explosion in the same vicinity, interacts with the Earth. In other words, the on-site data tell us about the seismic disturbances caused by the explosion, help us to understand better the seismic signature, and consequently have a direct impact on the quality of NTM monitoring. The single data point obtained from the JVE has already allowed significant improvement. As more such data is gathered over time, further improvement will be possible.

(b)(1)
(b)(3)(n)

(b)(1)
(b)(3)(n)

The Joint Verification Experiment

The JVE was an outgrowth of the Nuclear Testing Talks. It was conducted during the summer of 1988, and it served as a rehearsal for actual verification activities which will take place under the provisions of the two treaties limiting underground nuclear tests to 150 kilotons. In the JVE, the US and the USSR each measured the yield of a nuclear weapon test near 150 kilotons conducted by the other country.

According to the JVE agreement, the JVE was conducted for the "purposes of elaboration of effective verification measures for the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests of 1974 (TTBT)." The JVE consisted of two nuclear explosions, one at the US Nevada Test Site (NTS) and the other at the USSR Semipalatinsk Test Site (STS), each to have a planned yield between 100 and 150 kilotons.

In addition to teleseismic measurements, each side had the opportunity to measure and record local geological and geophysical data. Each side also can conducted on-site measurements of the yield of each JVE explosion using a scheme called hydrodynamic yield measurement, which, being done at the site of the nuclear explosion, is inherently much more accurate than the seismic technique. For the Soviet JVE, the initial on-site hydrodynamic yield estimate was 118 kilotons, with an uncertainty (F-factor) of 1.16. This means that there is a 95-percent certainty that the actual yield of the explosion was between 102 and 137 kilotons.

(b)(1)
(b)(3)(n)

Another way to express the quality of these estimates is in terms of the probability that the actual yield was above the treaty-obligated threshold of 150 kilotons. From the OSI estimate, there is a very low probability—essentially zero—that the JVE was a violati

(b)(1)
(b)(3)(n)

For the purpose of determining if the test was under 150 kilotons, as required by the TTBT, the on-site measurement is preferable to the teleseismic.

The JVE provided the US with the first validated yield of a Soviet nuclear weapon test. As such, it is a unique and invaluable addition to the information on which we base our NTM estimates of yields of Soviet nuclear weapons tests. It was stated in the JVE agreement that

> "Because the JVE is not designed to produce statistically significant results, it cannot by itself establish statistical proof of the accuracy of any particular yield measurement method."

Although the US insisted on this statement, it has no real practical significance. The phrase "by itself" is key in the following discussion, because the JVE result was not used by itself, but rather was combined with an extensive body of seismic data to improve—decrease—the uncertainty in our estimates of Soviet underground nuclear tests.

(b)(1)
(b)(3)(n)

(b)(1)
(b)(3)(n)

OSI's Treaty-Monitoring Value

In only the TTBT is it possible to use information gathered during OSI to improve directly our method of monitoring Soviet activities when inspectors are not present. Only TTBT OSI offers the prospects of quantitatively improving treaty monitoring via NTM.

The single JVE has already had a profound effect on the quality of teleseismic yield estimates by significantly reducing uncertainties of yield estimates for explosions at the Soviet JVE site at Shagan River. US NTM now has a much better capability for estimating the yield of Soviet nuclear tests at the Shagan River area. As on-site yield measurements are made at other locations, US capabilities using NTM also will improve for these areas.

Given a choice, on-site yield measurements would always be preferable. At its best, a teleseismic estimate does not provide the confidence possible from OSI. But when OSI is not available, for whatever reason, the US still has an improved NTM method because of past OSI opportunities.

This article is classified SECRET (b)(3)(n)