Looking for the nuclear needle in the haystack: The Integrated Field Exercise 08 in Kazakhstan

by Kirsten Haupt and Thomas Mützelburg

KAZAKHSTAN HOSTED PREVIOUS EXERCISES ON THREE OCCASIONS IN 1999, 2002 AND 2005.

Against the backdrop of the remote emptiness of the steppe in northern Kazakhstan, a most peculiar scene unfolds: seemingly materializing out of nowhere, figures clad in white plastic overalls pour out of vehicles while at the same time, truckload after truckload of odd-looking contraptions are unloaded. Within a short time, the landscape is speckled with shiny white tents.

What might seem to the unsuspecting onlooker like a scene from a science-fiction movie actually marks the beginning of an inspection exercise carried out by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO). This so-called "Integrated Field Exercise 2008" or IFE08 is taking place throughout September 2008 in the former Soviet Union nuclear test site in Kazakhstan's Semipalatinsk Region.

Largest-ever exercise undertaken by the CTBTO

The exercise is unprecedented in scope and size: it involves over 200 participants, consisting of an international team of 40 inspectors, the Kazakh hosts, an evaluation team, observers and an operation support centre in Vienna. In addition, almost 50 tonnes of equipment – the equivalent of six truckloads – have been flown to Kazakhstan. For all its scale and complexity, this exercise bears greater resemblance to a humanitarian aid operation than an inspection under a Non-Proliferation Treaty regime.

The IFE08 is the first comprehensive on-site inspection (OSI) exercise to encompass all phases of a nuclear test detection, from the first suspicious-looking seismic wave appearing on the screens at the CTBTO's International Data Centre (IDC) in Vienna, to the findings presented in the inspection report.

On-site inspections: the ultimate verification measure

An OSI is the ultimate verification measure of the CTBT. Real OSIs will be possible only after the Treaty has entered into force. Until then, all procedures and methods developed for such inspections have to be applied on an experimental basis, and equipment has to be tested for OSIs to be operational when the Treaty enters into force. From then on, the CTBTO must be in a position to launch an OSI at a few days notice because the evidence of a nuclear explosion, such as seismic aftershocks or certain radioactive particles, fades with every passing hour. The CTBTO's OSI team must therefore be veritable logistical wizards.

> "The Integrated Field Exercise is a major priority for us in 2008. It's important for preparing for the entry into force of the Comprehensive Nuclear-Test-Ban Treaty."
>
> CTBTO's Executive Secretary
> Tibor Tóth

The state-of-the-art technical methods that inspectors use on-site are diverse. They may include: multi-spectral imaging, gamma radiation monitoring, visual observation to detect anomalies in the surroundings, monitoring of seismic aftershocks, magnetic and gravitational field mapping,

> "What counts is to show the world that the CTBT's verification system really works."
>
> CTBTO's Executive Secretary, Tibor Tóth

ground penetrating radar and many more. Some of these methods are applied from the air, typically from helicopters.

In spite of this technical sophistication, the OSI regime strikes a careful balance between the ability to detect signs of nuclear testing and safeguarding the national security interest of the inspected Member State. In order for the OSI to be as unobtrusive as possible, the technical methods permitted are prescribed very precisely, even down to which type of radionuclide may be measured for inspection purposes and which must be ignored.

The area to be inspected is also limited to 1000 square kilometres, which is still larger than New York City with its five boroughs – a vast area for a handful of inspectors. Therefore the search for evidence of a nuclear explosion can be the proverbial search for the needle in the haystack!

All OSI procedures are set out in the OSI draft operational manual, which has been worked on since the inception of the CTBTO in 1996, and currently comprises – around 1000 pages including all subsidiary documents.

The final verdict

It is important to note that, according to the Treaty, it is the Member States and not the CTBTO who will pronounce the final verdict on whether a nuclear explosion (and hence a Treaty violation) has indeed taken place. The CTBTO's role will be limited to presenting the technical analysis on which the Member States base their verdict. In light of the constantly increasing sophistication of the verification system, however, these technical findings are likely to become ever more unambiguous.

HELICOPTER OVERFLIGHTS ARE ESSENTIAL TO OBTAIN A GENERAL OVERVIEW OF THE INSPECTION AREA

The system went through its baptism of fire in October 2006, when the Democratic People's Republic of Korea (DPRK) declared

DECONTAMINATION STATION PROCEDURES.

FIELD OFFICERS USING STATE-OF-THE-ART SEISMIC EQUIPMENT.

Phases of Nuclear Test Explosion Detection

Phase 1: The International Monitoring System (IMS) watches for signs of a nuclear explosion

When complete, the International Monitoring System (IMS) will consist of 321 monitoring stations and 16 laboratories worldwide. These 337 facilities will monitor the planet permanently for any sign of a nuclear explosion. 230 of these facilities are already operational. The IMS uses four complementary monitoring methods, utilizing the most modern technologies available. Seismic, hydroacoustic and infrasound stations monitor the underground, the oceans and the atmosphere respectively. Radionuclide stations detect radioactive debris from atmospheric, underground or underwater nuclear explosions.

Phase 2: Transmission of Signals to Vienna

Once one or more stations have detected signals indicating a possible nuclear explosion, relevant data on the time, location and magnitude of the 'event', as CTBT experts refer to it, are transmitted via the Global Communications Infrastructure (GCI) to the CTBTO's headquarters in Vienna. As the GCI uses modern communication technology such as satellites and secure data connections on the ground, it only takes up to 30 seconds for the data to be transmitted to Vienna from the time the station first registers the signal.

Phase 3: Processing and analyzing the data and transmission to Member States

At the IDC in Vienna, scientists process and analyze the incoming data. The raw data and analysis results are then distributed electronically to CTBT Member States all around the world.

Phase 4: Launching an OSI at the request of a Member State

At the request of one or more Member States, the CTBTO launches an OSI in order to clarify whether or not a nuclear explosion has been carried out. During such an inspection, facts are gathered to identify a possible violator of the Treaty.

that it had conducted a nuclear test. Despite the establishment of only two thirds of the IMS monitoring facilities at the time, the CTBTO proved that its verification capabilities already significantly exceeded the expectations of the Treaty's negotiators in 1996.

After the DPRK test, the IFE08 is the next milestone in demonstrating the Treaty's verifiability. ■

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PREPARING TO FLY A MAGNETIC PROBE. THIS IS ONE OF THE OSI TECHNIQUES THAT WAS EXERCISED IN THE KAZAKH STEPPE IN 2005.