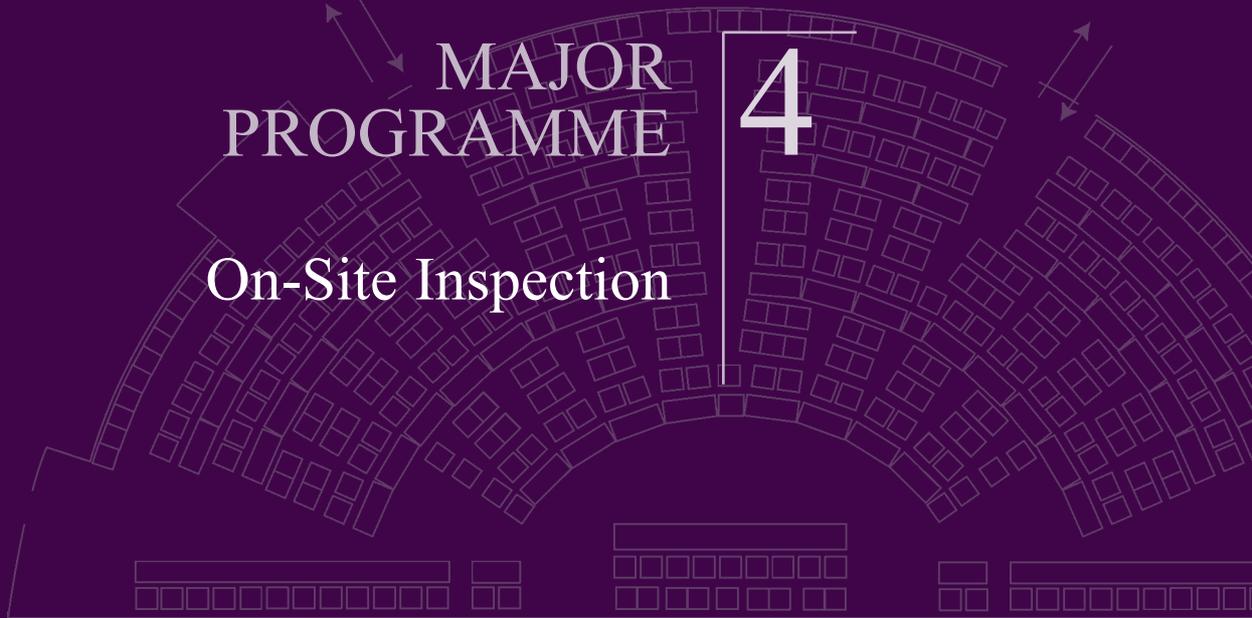




# MAJOR PROGRAMME

# 4

## On-Site Inspection



# Major Programme 4: On-Site Inspection

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The primary objective of Major Programme 4 is to make the necessary preparations for the establishment of the OSI regime at entry into force of the Treaty. The major elements of OSI are inspectors, equipment and the OSI Operational Manual, together with supporting infrastructures.

The year 2002 saw a continuous build-up of these preparations. A large scale OSI field experiment was successfully conducted in Kazakhstan. Its results are expected to help to build up the regime in an efficient way. Useful contributions were also made by conducting OSI Workshop-8, Experimental Advanced Course 3 and the feasibility study of radioactive xenon measurement equipment.

## DOCUMENTATION

### Elaboration of Draft OSI Operational Manual

The elaboration of the draft OSI Operational Manual remained a priority task of the Commission. Based on the initial draft rolling text (IDRT) of the manual, the first reading up to Chapter 5 (Inspection Preparations) was completed and work commenced on Chapter 6 (Inspections for Underground Event Within the Territory of a State Party). States Signatories continued to explore possible ways for improving the manual drafting process. An emerging view is that to make the manual easy to use, it may be desirable to supplement it with a series of subordinate documents that contain the operational details, especially those of a technical and administrative nature.

The Commission continued to encourage States Signatories to contribute to the development of the manual and tasked the PTS to provide relevant input to the elaboration process by preparing material and, in particular, drafting missing elements of the draft manual of a clearly technical and administrative nature, taking into account results from workshops and experiments conducted by the PTS, upon request and for consideration by WGB. The PTS will continue to give priority support to the elaboration process.

## Workshop

OSI Workshop-8 was held in Vienna from 24 to 28 June 2002, and concentrated on the manual elaboration, development of radioactive xenon and argon measurement systems and the results of the 2001 field experiment in Slovakia. Thirty-five experts from 17 States Signatories participated in the workshop.

The main outcomes reached at the workshop include specific suggestions on Chapters 3 and 4 of the manual, a proposal for WGB to consider functional requirements and technical specifications of the xenon and argon measurement systems, including the demonstration and testing of an available Ar-37 detection system, and the setting up of a special expert group under PTS supervision to work on a systematic utilization of the Seismic Aftershock Monitoring System (SAMS). The workshop also suggested that the PTS initiate development/selection and testing of software to support planning and implementation of OSI activities.

## METHODOLOGY, INFRASTRUCTURE AND FIELD EXPERIMENTS

Following more than one year of intensive planning, and building on the lessons learned during the suc-

successful field experiment in Slovakia in October 2001, the PTS conducted a large scale OSI field experiment in Kazakhstan in September–October 2002 (FE02). More than 25 surrogate inspectors, from 17 States Signatories and the PTS staff, spent three weeks in a remote part of Kazakhstan performing inspection activities, much as a real inspection team (IT) would following entry into force of the Treaty.

The experiment began with the simulation of an illicit underground nuclear explosion caused by detonating 12.5 tonnes of chemical explosives about 200 metres underground, utilizing an unused borehole at the former Soviet Union’s nuclear test site near Semipalatinsk, Kazakhstan. In addition, to increase realism, several other kilogram sized chemical explosions were arranged to simulate the seismic aftershocks that would accompany an underground nuclear explosion. This scenario was not disclosed to the surrogate inspectors, so that they could more realistically perform some of the ‘detective’ functions required of a real IT.

The techniques employed by the surrogate inspectors over the 450 square kilometre inspection area included deployment of nearly a dozen portable seismometers, and the in-field collection and analysis of the data collected therefrom, to search for aftershocks; collection of soil and air samples in search of OSI-relevant radionuclides; and visual observation, including six hours of low altitude helicopter overflight, looking for anomalies or indications of recent human activity.

For the first time, these OSI techniques were performed and examined in an integrated fashion to ascertain the complementarity or synergy among them. In order to synthesize the data from these activities and to plan and control its in-field activities, the surrogate IT had to establish a base camp in a mining camp near the inspection area, and utilize and test communication equipment and procedures.



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*OSI field experiment in Kazakhstan:*

1. Triggering event.
2. OSI equipment in transit.
3. Helicopter for overflight.
4. Aerial view of terrain.



FE02 also examined the interactions between an IT and a temporary Operations Support Centre (OSC) established in Vienna. These interactions included the activities to launch an OSI on the very short schedules required by the Treaty and by the rapid decay of some of the signatures that an IT would search for. Thus a small core element of the IT was brought to the OSC to do the pre-inspection planning for when the team would arrive in the field. As part of this process, commercial high resolution satellite imagery was obtained and combined with the extremely sparse map information available for the region to make a multi-source map for the inspectors. More than 2 tonnes of equipment was shipped from Vienna to the point of entry in Almaty, Kazakhstan.



As a part of the preparation for FE02 an initial health and safety (HS) concept was developed. This concept, inter alia, requires that future inspectors receive adequate HS training during an OSI and that they meet appropriate fitness standards. Other elements of the HS programme that were exercised during FE02 included performing radionuclide surveys as part of inspection activities and monitoring participants' exposure to radiation while working in the former nuclear test site (none of the participants was exposed to a radiation level higher than the average background).



Because the objectives of FE02 were to contribute to the elaboration process of the draft OSI Operational Manual as well as to PTS practices and procedures related to OSI activities, six evaluators observed every aspect of FE02, recording several hundred lessons and recommendations. These will be considered by the PTS and the PMOs, as appropriate, for possible implementation. The lessons may help guide the scope of OSI equipment characteristics and employment, and the development of inspector training programmes, as well as future OSI field experiments and simulations.



*OSI field experiment in Kazakhstan (cont.):*

- 5. Taking an environmental soil sample.
- 6. Collecting soil gas samples.
- 7. Monitoring for radioactive contamination.
- 8. Operations centre at the base camp.

## TRAINING AND OPERATIONS

The main goal of OSI training activities continued to be the development of a programme of training and exercises for future inspectors and inspection assistants.

The PTS finalized its proposal for a Long Range Plan (LRP) for the training and exercise programme (TEP) to be used after the entry into force of the Treaty. The PTS proposal includes the required qualifications of



*Third OSI Experimental Advanced Course, Vienna, November 2002.*

the trainee inspectors, the necessary training courses and exercises and their curricula, the training cycle, identifying possible trainers, an implementation plan and costs. The LRP was presented to WGB in 2002, and its objectives and structure for a training cycle were generally accepted. The PTS will continue to develop training concepts and tools based on this draft LRP with a view to preparing, for consideration by the PMOs, possible final curricula for all the courses to be used in the training cycle for inspectors and inspection assistants after entry into force.

As an established element of the LRP, the sixth OSI Introductory Course took place in Vienna from 6 to 10 May 2002 with 39 participants, consisting of experts in OSI technologies and representatives of National Authorities, from 32 States Signatories. The main topics covered were the phenomenology of nuclear explosions and the OSI process, including key elements such as managed access. By the end of 2002, 215 trainees had participated in introductory courses contributing to the build-up of the OSI regime and to an increase in the cadre of potential can-

didates for advanced training activities, field experiments and OSI equipment testing.

The third OSI Experimental Advanced Course (EAC3) for the leadership of the IT was conducted in Vienna from 18 to 25 November 2002. Twelve experts from 12 States Signatories participated in the course, which was a short version of the planned full scale course. The aim, as defined in the LRP, was to test the concept and develop a curriculum of the relevant Advanced Course with the specific requirements for OSI leadership. The participants discussed and commented on the experimental curriculum presented to them. As a result of practical experience gained through the course, it was concluded that the curriculum of the full scale course should combine training in team building and negotiation skills with scenario based simulations and case studies based on various OSI situations. The full scale course is also expected to include a review of relevant parts of the OSI Operational Manual and field exercises.

## EQUIPMENT

A list of equipment for use during OSIs must be considered and approved at the initial session of the Conference of the States Parties. The current status of the Commission's work on a list of equipment for various categories and approval of the initial specifications thereof is summarized in Table 3. The Commission's mandate also requires it to acquire or otherwise make provisions for the availability of relevant inspection equipment, including communication equipment, and conduct technical tests of such equipment as necessary. The types of equipment currently in the custody of the PTS are also indicated in the table. In 2002, the Commission approved a revision to the specifications for video cameras. However, although efforts continued, no substantial equipment categories additional to those presented in the 2001 Annual Report – especially of specialized OSI equipment – were obtained or added to the PTS custody/inventory in 2002, nor were offers or pledges for these items received from States Signatories.

The PTS therefore continued to devote significant effort to further refining the requirements for and methods of obtaining equipment with unique technical

**Table 3. Current Status of List of OSI Equipment and Technical Specifications Approved by the Commission for Testing and Training Purposes**

| Activities and Techniques Specified in Part II of the Protocol to the Treaty                                                                                                                                                                                                                                                                                                                                                                                          | Equipment Approved (or to be Further Considered) by the Commission                                         | Equipment Obtained by the PTS <sup>a</sup> |                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                            | In PTS custody                             | In State Signatory custody |
| Position finding (para. 69(a))                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                            |                                            |                            |
| • From the air                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Analogue altimeter                                                                                         | ✓                                          |                            |
| • At the surface                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Satellite based positioning system                                                                         | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Handheld range finding equipment                                                                           | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Pocket transit compass                                                                                     | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Analogue altimeter                                                                                         | ✓                                          |                            |
| Visual observation (para. 69(b))                                                                                                                                                                                                                                                                                                                                                                                                                                      | Field glasses/binoculars                                                                                   | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Binocular microscope                                                                                       | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Magnifying glass                                                                                           | ✓                                          |                            |
| Video and still photography (para. 69(b))                                                                                                                                                                                                                                                                                                                                                                                                                             | Handheld 35 mm camera                                                                                      | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Handheld instant camera                                                                                    | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Media for camera                                                                                           | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Processor for photographic film                                                                            | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Handheld video camera (analogue)                                                                           | ✓ <sup>b</sup>                             |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Video cassette recorder                                                                                    | ✓                                          |                            |
| Multispectral imaging (including infrared measurements) (para. 69(b))                                                                                                                                                                                                                                                                                                                                                                                                 | Not yet approved                                                                                           |                                            |                            |
| Measurement of levels of radioactivity – gamma radiation monitoring and energy resolution analysis (from the air and at or under the surface) (para. 69(c))                                                                                                                                                                                                                                                                                                           | Handheld search and limited gamma identification tools                                                     | ✓                                          |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Vehicle-portable search and limited gamma identification tool                                              |                                            |                            |
| Current list of radionuclides of OSI interest:<br><sup>37</sup> Ar, <sup>95</sup> Zr, <sup>95</sup> Nb, <sup>99</sup> Mo, <sup>103</sup> Ru, <sup>115m</sup> Cd, <sup>131</sup> I,<br><sup>132</sup> I, <sup>132</sup> Te, <sup>131m</sup> Xe, <sup>133m</sup> Xe, <sup>133g</sup> Xe,<br><sup>135</sup> Xe, <sup>140</sup> Ba, <sup>140</sup> La, <sup>141</sup> Ce, <sup>144</sup> Ce, <sup>144</sup> Pr,<br><sup>147</sup> Nd, <sup>99</sup> Tc, <sup>106</sup> Rh | High resolution gamma spectrometer tool for field and laboratory use – ‘blinded’ or measurement restricted |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Equipment for xenon sampling, separation and measurement                                                   |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Argon-37 equipment for sampling, separation and measurement – not yet considered                           |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Aerial gamma spectroscopy equipment                                                                        |                                            |                            |
| Environmental sampling and analysis of solids, liquids and gases (para. 69(d))                                                                                                                                                                                                                                                                                                                                                                                        | To be elaborated                                                                                           |                                            |                            |
| Passive seismological monitoring for aftershocks (para. 69(e))                                                                                                                                                                                                                                                                                                                                                                                                        | Passive seismic equipment                                                                                  | ✓                                          |                            |
| Resonance seismometry and active seismic surveys (para. 69(f))                                                                                                                                                                                                                                                                                                                                                                                                        | Resonance seismometry equipment – not yet approved                                                         |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Active seismometry equipment – not yet approved                                                            |                                            |                            |
| Magnetic and gravitational field mapping, ground penetrating radar, electrical conductivity measurements at the surface and from the air (para. 69(g))                                                                                                                                                                                                                                                                                                                | Magnetic field mapping equipment                                                                           |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Gravitational field mapping equipment                                                                      |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Ground penetrating radar                                                                                   |                                            |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Electrical conductivity measurement equipment                                                              |                                            |                            |
| Drilling (para. 69(h))                                                                                                                                                                                                                                                                                                                                                                                                                                                | Not yet considered                                                                                         |                                            |                            |
| Communication equipment (para. 62)                                                                                                                                                                                                                                                                                                                                                                                                                                    | Not yet considered                                                                                         |                                            |                            |

<sup>a</sup> Equipment ‘obtained by the PTS’ is categorized in accordance with paragraphs 39 and 40 of Part II of the Protocol and is obtained by the PTS through special procurement procedures in accordance with the decision of the Commission at its Eighth Session (CTBT/PC-8/1/Annex II).

<sup>b</sup> This item indicates progress made since the 2001 Annual Report.

specifications. For xenon sampling, separation and measurement equipment, a comprehensive feasibility study commissioned and undertaken by an independent contractor was completed. As a result, enhanced progress can be expected towards achieving the Commission's technical objectives for this technique following acceptance of the refined functional and operational requirements. In collaboration with the Istituto Nazionale di Geofisica e Vulcanologia, Italy, the PTS also finalized preparation of the initial phase of the equipment demonstration programme, to be conducted in 2003 for some approved geophysical techniques, in which State Signatory nominated experts will participate. Further significant progress was also achieved in improving the functional capabilities of hardware and software for passive seismological monitoring for aftershocks, based on the recommendations and suggestions of State Signatory experts who participated in the related activities. This effort is expected to be continued with field testing of the equipment. A prototype relational database was developed by the PTS to assist in monitoring the status of all equipment items: this has the capability to generate required reports for operational purposes. The prototype is currently being refined and upgraded.



*Handheld search and limited gamma identification tool.*



*Portable processor for photographic colour film.*

