ON-SITE INSPECTION

HIGHLIGHTS IN 2018

Implementation of the OSI action plan for 2016-2019 and the OSI exercise plan for 2016-2020

Training courses of the third training cycle for inspectors

Design and construction of a permanent Equipment Storage and Maintenance Facility

The IMS and IDC monitor the world for evidence of a nuclear explosion. If such evidence were to be detected, the Treaty provides for concerns about possible non-compliance with the Treaty to be addressed through a consultation and clarification process. After the Treaty enters into force, States can also request an OSI, which is the final verification measure under the Treaty.

The purpose of an OSI is to clarify whether a nuclear explosion has been carried out in violation of the Treaty and to gather facts that might assist in identifying any possible violator.

Since an OSI can be invoked by any State Party at any time, the capability to conduct such an inspection requires policies and procedures to be developed and inspection techniques to be validated before the Treaty enters into force. In addition, OSIs require adequately trained personnel, approved core inspection equipment, appropriate logistics and related infrastructure to sustain a team of up to 40 inspectors in the field for a maximum of 130 days while enforcing the highest standards of health, safety and confidentiality.

Over the years, the Commission has continuously strengthened its OSI capabilities through the preparation and development of OSI elements, the conduct of field exercises and the evaluation of its OSI activities. With the conclusion and evaluation of the 2014 Integrated Field Exercise (IFE), the Commission started a new cycle of OSI development and implemented a new action plan for OSI activities in 2016-2019.
On-Site Inspection Action Plan for 2016-2019

Activities during 2018 focused on implementation of the OSI action plan for 2016-2019 and the initial activities of the OSI exercise plan for 2016-2020, which is derived from the review and evaluation process of the 2014 IFE. Action plan projects and exercises aim to further OSI capabilities towards the establishment of a balanced, coherent and robust verification regime when the Treaty enters into force, within an integrated PTS-wide development, testing, training and exercise framework. The plans were presented to the Forty-Sixth Session of WGB and approved by the Commission at its Forty-Sixth Session in June 2016.

The OSI action plan for 2016-2019 comprises 43 projects categorized into five categories: policy development, methodology and documentation, operations and operations support, techniques and equipment development, and inspectorate development and infrastructure development.

During 2018, 17 projects were completed and 26 were under implementation, addressing 85% of the recommendations from previous build-up exercises (BUEs) and the 2014 IFE as contained in the OSI database of issues and lessons identified.

Policy Planning and Operations

OSI policy planning and operations efforts during 2018 were closely related to the implementation of OSI action plan projects and the OSI exercise plan, including overall coordination of the action plan and the management of five individual projects that were under implementation.

Three policy documents, on physical security, information security and health and safety during OSIs, were formally approved. The inspection team functionality manual and the SOP on field team functionality were updated and reviewed and entered the formal approval process. Substantial recommendations were provided to the study aimed at investigating the effects of extreme environmental conditions on OSI operations during OSI Workshop-24.

Phase II of the Geospatial Information Management for OSI (GIMO) system was further developed on the basis of recommendations and lessons from the 2014 IFE, a dedicated expert meeting and a tabletop exercise on inspection team functionality, field team functionality and search logic. An advanced version of GIMO comprising full inspection planning capabilities and integration of equipment, personnel and tasks to conduct selected missions was successfully tested during the advanced course of the third training cycle. The OSI databank was updated and integrated in other OSI databases and the GIMO system.

OSI communications equipment underwent maintenance and updating, and some of it was used in training and testing activities.

Capability gaps in the health and safety equipment portfolio were filled on the basis of recommendations from OSI Workshop-23. Medical equipment upgrades comprising a portable blood gas meter and a heart rate monitor for the field were procured and brought into service.

On-Site Inspection Exercise Plan for 2016-2020

The OSI exercise plan for 2016-2020 outlined the intention of the PTS to conduct a series of exercises aimed at validating key products of projects under the OSI action plan for 2016-2019. The OSI exercise plan includes proven exercise concepts, in particular tabletop exercises and field exercises.

An expert meeting on the concept for future BUEs was conducted in January 2018. It involved 40 experts including 21 external participants from 15 States Signatories and representatives of international organizations and the PTS. The programme included discussions of the BUE concept, exercise design, planning and preparations and resulted in technical and policy recommendations on the draft exercise and evaluation concepts. The output of the meeting was a concept for the preparation and conduct of future BUEs that was made available to States Signatories in an Information Paper prior to the Fiftieth Session of Working Group B.

Following a WGB recommendation and interest shown by neighboring countries to host the exercises, the BUE project management team started a process to identify suitable field exercise locations within 300 km of the Vienna International Centre. The PTS conducted reconnaissance visits to three sites to assess their suitability as field exercise locations. Potential host countries were invited to submit a financial offer to host field exercises. Following technical and financial evaluations, the PTS accepted the offer of Slovakia.

As reiterated by participants at the expert meeting on the concept for future BUEs, OSI exercises require a realistic and credible scenario. On this basis, a scenario task force was established, comprising 17 technical experts from 12 States Signatories including the host country and PTS staff. The task force held three meetings during 2018 aimed at developing a contiguous scenario for the three BUEs to be conducted in 2019-2020. The resulting scenario is technically realistic, rationally coherent, temporally logical and intellectually motivating so that OSI processes, procedures and techniques can be adequately tested.
Equipment, Procedures and Specifications

The implementation of OSI action plan projects related to inspection techniques and capabilities progressed further. Upon project completion, revised or proposed equipment specifications will be submitted to WGB for possible inclusion in the draft list of equipment for use during OSIs. These projects will also result in improved procedures for the application of the inspection techniques that will ultimately be reflected in new or updated Quality Management System (QMS) documents.

The year 2018 also saw the launch of the last OSI action plan project related to inspection techniques, i.e. drilling. The objective is to better understand the complexities of drilling and its potential applications during an inspection. The first two project phases, comprising the compilation of background information on the basis of previous documents, meetings and conferences and the conduct of an expert meeting in Vienna were implemented. The final project phase, to be undertaken in 2019, will encompass the execution of action points agreed during the meeting and any other follow-up activities.

Regular operational activities in support of the programme of the Equipment and Implementation Section of the OSI Division were undertaken throughout the year and significant input was provided to the third OSI training cycle through planning and preparation of relevant technical modules of the advanced training course.

With the construction of a permanent Equipment Storage and Maintenance Facility under way in 2018, the Commission continued to cooperate closely with the Austrian authorities to alleviate resource and operational constraints at the temporary storage area. This cooperation allowed the PTS to use the facilities and resources of the Austrian Ministry of Defence for the development and testing of OSI techniques, notably in the fields of OSI airborne systems and geophysical inspection techniques for shallow applications.

Contributions were made in 2018 to the General Assembly of the European Geophysical Union and the Long Night of Research, both in Vienna.

Airborne Techniques and Visual Observation

A validation test of the airborne multispectral system was performed in cooperation with the Austrian Armed Forces in Linz, Austria, in June 2018. Seven experts from seven States Signatories participated. They were familiarized with the operation of the system and given an opportunity to operate the system in-flight on board a Bell 212 helicopter. A demonstration of airborne mission planning and data processing software was also provided. The week culminated with the experts helping to uninstall the system, followed by a review of system performance measured against the specifications set out in the draft equipment list developed at OSI Workshop-23.

Work has commenced to develop an airborne physical simulator to support the testing of airborne systems as well as the training of inspectors in the application of airborne techniques. The simulator is designed to provide a realistic environment to test the installation of hardware components and the procedures for the operation of different systems, thus reducing the need for actual helicopter airtime. It will be used prior to actual airtime to train inspectors in the application of airborne techniques and health and safety procedures when working around and on an airframe. This arrangement will allow facilitators to expose trainee inspectors to equipment faults and issues that may arise in-flight and provide instruction on corrective actions.

Airborne video and narration systems were upgraded and tested in Vienna on board an AS 350 helicopter prior to being used for inspector training in South Africa in October 2018. The procedures for ground testing the equipment and operating the systems in-flight were updated and validated during these test flights.

A desk study on the potential of air and ground based remotely controlled autonomous systems for data gathering and in-field support activities within the context of an OSI was concluded. The findings of the study were reported to the Fifty-First Session of WGB. Proposals for future studies and the use of such platforms within the context of an OSI were also presented to WGB.
Geophysical Inspection Techniques

An expert meeting on resonance seismometry was held in Vienna in May 2018. The purpose of the meeting was to provide guidance on numerical modelling and data processing, to draft input for a concept of operations and to confirm and/or amend the equipment specifications documented in the report of OSI Workshop-23. Twenty-two experts from 13 States Signatories reviewed the results of numerical and experimental studies and discussed relevant observables, resulting in the updating of the technology evaluation matrix for resonance seismometry and relevant documentation, including in relation to integrating resonance seismometry with other OSI techniques.

A field test of OSI geophysical techniques for shallow applications was carried out at an Austrian military training ground near Vienna in September 2018. Nine experts from seven States Signatories participated in the field test, which was designed following a market survey and performance testing of selected non-seismic geophysical equipment. The performance testing considered particular OSI requirements and addressed technical specifications and operational procedures. As a result, equipment for electrical conductivity measurements, magnetic field surveys and ground penetrating radar was identified as being in compliance with OSI requirements and subsequently tested. The field test assessed functionality and operational use of all equipment and resulted in amendments to the technical specifications for geophysical equipment as documented in the report OSI Workshop-23. Relevant SOPs and work instructions (WINs) will be updated once new equipment is obtained. The test also served as a basis for procuring equipment for use during future training activities.

Measurements of Radioactivity and Radionuclide Particulate Related Inspection Techniques

A feasibility study on weather support and ATM activities that would be required for different phases of an OSI was conducted. The report of this study provided key findings and recommendations for the actual development of ATM capabilities in support of an OSI.

The certification of airborne gamma radiation survey equipment on board a Bell 212 helicopter was prepared with the support of the Austrian Armed Forces during two technical meetings held in March and June 2018 in Linz, Austria. The meetings focused on practical integration of PTS equipment with the aircraft and on procedures to prepare the relevant documentation for airworthiness according to Austrian standards. Specific supporting equipment to mount the global navigation satellite system antenna was manufactured at the Linz military workshop, and an interface to the helicopter power was built with air certified parts to operate the airborne gamma survey equipment in a safer configuration and avoid the need for on-board batteries.

Five portable gamma radiation monitoring (GRM) scanners were delivered and brought into OSI operational status. The scanners have new capabilities that were recommended by the expert meeting on radionuclides and noble gases held in 2015. An upgraded acquisition sub-system allows summing signals from up to three sensors and doubles the detection sensitivity of the previous range of GRM scanners, thereby providing increased flexibility during field missions. In addition, the new software operated on a tablet sized screen.
provides the operator with real time mapping capability of survey mission raw data.

Specifications for two car borne GRM survey sensors were issued. The sensors have a similar acquisition module as the portable GRM scanners and may be used as individual systems or in a single unit with doubled detection efficiency and software assisted directional detection capability. Acceptance tests will be carried out in early 2019.

A field application for the acquisition of raw GRM data, including data from high resolution in situ systems was designed and developed. The application was developed in synergy with the development of the GIMO system for full integration of data flow and processes.

The transportable 20 foot container that currently provides the infrastructure for the OSI field laboratory was maintained at the temporary storage area in order to host training modules in 2019. The second phase of a detailed design proposal for intermodal rapid deployment containers with modularized and extendable options is drawing to a close.

**Noble Gas Related Inspection Techniques**

Work to adapt mobile xenon and argon measurement devices for flight pods and to improve these systems progressed steadily. In parallel, the OSI SAUNA system for xenon detection was further developed with financial support provided by the EU under Council Decision VII.

One newly designed deployable atmospheric air sampler was brought into service to increase noble gas sampling capacity, and work on new subsurface gas samplers commenced. A comprehensive literature review and testing carried out as part of efforts to improve gas separation in the field for smaller and more easily transportable samples resulted in two reports on the materials that are best suited to this purpose. A design plan for a separation setup for xenon was drafted and additional work on further noble gas detection capabilities commenced.

**Operations and Operations Support**

OSI action plan projects related to operations and operations support were extended until the end of 2019 due to their interrelationship with ongoing projects related to OSI methodology, techniques and equipment development.

The design of a comprehensive security system for the base of operations was finalized in 2018, with the delivery of a customized, integrated, deployable security and surveillance system foreseen in 2019. The engineering design for improved units that can be transported and deployed by air and customized for command post and field laboratory applications is nearly complete, with manufacture and testing of a prototype unit scheduled for the second half of 2019.

A comprehensive review of potential options and arrangements to ensure guaranteed access to strategic airlift capability for OSI purposes was completed in 2018. Recommendations from this review will be followed by testing of brokered air charter services and considered in further development projects upon full implementation of the OSI action plan.

A needs analysis was carried out as part of a study of the potential use of third party contracts and standing arrangements in support of an OSI, taking into consideration the provisions of the Treaty and its Protocol, the draft OSI Operational Manual as well as the demands of launching and supporting field operations.

Upgrades for the base of operations infrastructure focused on modernized and ruggedized softshell modules, field electrical distribution and air conditioning systems. A study on hybrid power generation capabilities for the base of operations and for in-field operations was launched.

Operations support activities included scheduled maintenance, calibration and certification of all major auxiliary OSI equipment components (e.g. generator sets, uninterruptible power supplies). This also comprised continuous servicing and replacement of infrastructure to extend the life cycle of current equipment modules.

The temporary storage area provided infrastructure and logistics support to OSI programmatic activities, including a testing environment to simulate the working and receiving areas of a base of operations for an OSI. Staff of the OSI Division continued to serve as core members of the PTS-wide project team that manages the temporary storage area and provides logistics support services.

**On-Site Inspection Documentation**

Activities during 2018 involved providing support to WGB and implementing action plan projects, including further development and revision of OSI QMS documents and the conduct of OSI Workshop-24, entitled “OSI in Different Environments and Events Other Than Underground”.
Reporting

A report on the expert review of the progress inspection report and preliminary findings document generated during the 2014 IFE was issued in January 2018. Drafting of headquarters procedures for preparing and handling of the draft inspection report and revised WINs for inspection team reporting incorporating new GIMO functionality also commenced.

Quality Management System

Many OSI QMS documents underwent revision, came under review, or were approved. Policies on physical security during an OSI and on information security related to OSIs were approved and issued, as was the OSI health and safety policy. The rolling list of QMS documents was updated and the WIN on preparing and updating the rolling list was revised. The SOPs on launch and support for OSI, organization and activities of the Operations Support Centre (OSC), protection of information during an OSI and the inspection team functionality manual as well as the WIN on guidelines for classification of OSI related information and data entered the QMS review process.

Work also began on printing field versions of newly developed or revised and approved QMS documents, and sample booklets for five QMS documents were received. The topic codes used in the OSI e-Library were revised to better reflect OSI documentation and equipment. A contractor was selected to produce a study on the QA/QC requirements of the OSI field laboratory and preparation and conduct of an OSI.

On-Site Inspection Administration and Document Control

Documents used in the 2014 IFE were updated and new documents related to inspection team and OSC administration and documentation control related procedures were drafted. Several WINs on activities, tasks and responsibilities of the OSC were drafted.
**Improved On-Site Inspection e-Library**

With the testing phase nearly completed, significant progress has been made with respect to the functionality and user friendliness of the improved OSI e-Library. In particular, this included determining and testing the most effective way to create a replica of the OSI e-Library that can be exported to and interfaced with the GIMO system. Links were added to the OSI e-Library, interfacing it with the PTS QMS site and the knowledge and training portal. Such interfacing is crucial for the overall aim of building up OSI capability and ensuring all software is operational and reliable.

Work continues on creating new metadata across the OSI e-Library, reflecting the revised and most up to date coding system. Furthermore, a means of generating a list of all or specific documents in the repository of the e-Library was developed and improved. The user manual for the e-Library was also developed, and plans for a staff training course are under way.

**Support to Working Group B**

The PTS continued to provide substantive, technical and administrative assistance to WGB in its third round of elaboration of the draft OSI Operational Manual.

**Training**

**Advanced Course of the Third Training Cycle**

The advanced course of the third training cycle was held at the Denel Overberg Test Range in South Africa in October 2018. Seventy candidates representing 44 States Signatories from all regions participated. The goal of the advanced course was to prepare trainees for OSI activities grounded in inspection team functionality and field team functionality concepts. A variety of training methodologies with a focus on practical learning, such as field training exercises, were used. The trainees demonstrated competence in implementing information-led search logic during the launch, pre-inspection and inspection phases of an OSI. The course also included soft skills training on negotiation techniques, cross-cultural communications, decision making mechanisms, leadership styles and team building. The course was hosted by the South African Council for the Non-Proliferation of Weapons of Mass Destruction and the South African Council for Geoscience.
Ground and Airborne Based Visual Observation Course

The ground and airborne based visual observation course of the third training cycle was held at the same training site immediately after the advanced course. It was the first in a series of technique specific courses that will be delivered to the various technical sub-teams of the third training cycle. A total of 16 candidates from the visual observation sub-team, representing 15 States Signatories, participated. The objective of the course was to provide hands-on practice in identifying potentially relevant OSI observables acquired through both ground and airborne visual observation techniques. This included the planning, preparation and execution of helicopter overflight activities. This course was also hosted by the South African Council for the Non-Proliferation of Weapons of Mass Destruction and the South African Council for Geoscience. The host agencies also provided the use of a helicopter, its aircrew and fuel as a contribution in kind.

Training Event Registration Mechanism, On-Site Inspection Inspectorate Database and Call-Up Mechanism

The integration of the OSI inspectorate database with the services, training and management system and the conference, training and workshop registration platform was completed in 2018. Legacy data from the previous inspectorate database was migrated to the services, training and management system test environment to assess compatibility and to determine the requirements for further developments to support the functionality requirements of the OSI inspectorate database. This new mechanism was used to support the processing of nominations and registrations for all OSI training events in 2018.

An initial test of the OSI inspectorate call-up mechanism was conducted during the advanced course in South Africa. During the 24 hour test period, all participants in the third training cycle received automatically generated SMS and email messages instructing them to respond to a theoretical call-up for an OSI. The call-up platform succeeded in reaching all test subjects in all geographical regions.

On-Site Inspection e-Training System

A cloud based remote e-training system on inspection team functionality and the GIMO system was launched in September 2018 in support of the future activities of the third training cycle. The integration of geospatial data simulation into this remote training platform allows for additional training scenarios with critical inspection team functionality concepts such as the updating of search logic and the proposing and prioritizing of missions and allows trainees to conduct virtual operational steps such as inspection team meetings and the narrowing of search zones. This secure platform also provides the possibility of developing various OSI scenarios with realistic geospatial data for classroom based training. The development and implementation of this training system, which simulates the daily operations cycle of an individual inspector and uses data simulation models to conduct virtual field missions, will be used for all training for the remainder of the third training cycle.