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LLNL-TR-418860

REPORT OF ON-SITE INSPECTION WORKSHOP-16

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October 28, 2009

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This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Distr.: LIMITED
CTBT/WS/OSI-16/1
20 July 2009

ENGLISH ONLY

CTBTO PREPARATORY COMMISSION | preparatory commission for the comprehensive nuclear-test-ban treaty organization

REPORT OF ON-SITE INSPECTION WORKSHOP-16

IFE Lessons Learned and Follow-Up

(Brunn am Gebirge, Austria, 3-7 May 2009)

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Boris Kvok

Co-Chairpersons:
Vitaliy Shchukin, Jay Zucca

Rapporteur: Jerry Sweeney

Subject Leaders:
Lessons Learned: Hermann Lampalzer, Bela Balczo
Technical Review: Rainier Arndt, Peter Labak
Future Planning: Vitaliy Shchukin, Jay Zucca

Summary

The central issue addressed by this workshop was the task of making the on-site inspection (OSI) part of the Comprehensive Nuclear-Test-Ban Treaty verification system operationally ready at entry into force of the Treaty. It is recognized, and this was emphasized by the 2008 OSI Integrated Field Exercise (IFE), that it is not possible to develop every part of the OSI regime simultaneously. Therefore, it is necessary to prioritize the approach to OSI readiness.

The reviews of the IFE have pointed to many elements of OSI readiness that still need development. The objective of this workshop was to provide priorities for the path forward for Working Group B to consider. Several critical areas have been identified that are related to the development of OSI readiness:

- Technology development: Priorities are radionuclide and noble gas sampling and analysis, visual observation, multispectral/infrared imaging methods, active seismic methods and the recognition of the importance of signatures.
- Organizational development: Priorities are health and safety, the Operations Support Centre, the Equipment Storage and Maintenance Facility, information technology data flow and communications.
- Resources: The expertise to develop key parts of the OSI regime is not available within the current OSI Division staff. To develop these aspects of the regime will require more staff or supplements to the staff with cost-free experts or other means. Aspects of the system that could benefit from more staff include radionuclide and noble gas detection methods, data flow and communications, visual observation, multispectral/infrared methods and health and safety.

As the path forward, participants of this workshop recognized a need to optimize the development of OSI priorities. The outcome of this workshop is to suggest for consideration an operational approach to OSI readiness that utilizes results of an evaluation of the relative effectiveness of OSI elements versus their relative maturity. By integrating such an assessment with considerations of integrated operational capabilities and the anticipated level of inspection team self-sufficiency and measurable milestone criteria, a set of priorities for OSI development can be developed. Once these priorities have been established, the Policy Making Organs can decide upon the milestones, strategic plan and action plan to serve as guidance for implementation by the Provisional Technical Secretariat.

The suggested operational approach is as follows:

(1) Assess the relative effectiveness (importance) of OSI elements versus their relative maturity.

(2) Determine the anticipated level of self-sufficiency.

(3) Define measurable milestone criteria.

(4) Result: Milestones for OSI readiness.

Rapporteur's note: Those readers desiring to focus only on the specific recommendations of this workshop are urged to skip the details of the proceedings and go to the three sections at the end of this report that are entitled "Basic Findings", "Continuing Issues" and "Future Planning".

Contents

Abbreviations

CiK	contribution in kind
CPT	continuation period techniques
CSAMT	controlled source audiomagnetotellurics
CTBT	Comprehensive Nuclear-Test-Ban Treaty (“the Treaty”)
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization (“the Organization”)
DMS	documentation management system
ECS	Experts Communication System
EIF	entry into force
ESMF	Equipment Storage and Maintenance Facility
FIMS	field information management system
GPR	ground penetrating radar
HPGe	high purity germanium
IAEA	International Atomic Energy Agency
IDC	International Data Centre
IFE	Integrated Field Exercise
IMS	International Monitoring System
IR	infrared
ISP	inspected State Party
IT	inspection team
LAN	local area network
MS	multispectral
OSC	Operations Support Centre
OSI	on-site inspection
PMO	Policy Making Organ
PTS	Provisional Technical Secretariat
SAMS	Seismic Aftershock Monitoring System
SOP	standard operating procedure
TEM	transient electromagnetics
UAV	unmanned aerial vehicle
UNE	underground nuclear explosion
WGB	Working Group B

INTRODUCTION

This workshop had two purposes: (1) to conclude the evaluation of the 2008 On-Site Inspection (OSI) Integrated Field Exercise (IFE); and (2) to provide guidance for the next steps for OSI development. The workshop consisted of the following elements, covered via four different sessions:

(1) Review of the results of the IFE, focusing on the lessons learned and recommendations;

(2) Consideration of new knowledge and additional technical issues related to all stages of OSI;

(3) A summary and discussion by subject leaders of IFE lessons learned, a review of technologies and future planning options.

PROCEEDINGS

OPENING REMARKS

Kvok welcomed participants to OSI Workshop-16 and set the direction of the meeting by pointing out that this workshop is part of the final step of the 2008 IFE to assess the lessons learned and recommendations of the IFE and define the next steps for development of OSI capability. It is an appropriate time to review the status of OSI development and start the process of planning the completion of OSI capabilities now that the prospects for entry into force (EIF) of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) are much brighter than they have been for some time.

Shchukin pointed out that the work of this workshop goes back to the original concept of technical OSI workshops that was in place in the early years of Working Group B (WGB) activities. He emphasized that OSI Workshop-16 is a technical workshop – it is a way to bring together knowledge about OSI to help guide WGB for the path forward towards EIF. This workshop has a twofold nature: (1) it concludes the evaluation of the IFE; and (2) it provides guidance for the next steps for OSI development.

He noted the following expected outcomes of the workshop:

- Provide a forum for participants to provide views, opinions and suggestions drawing from the IFE lessons learned and technical issues related to OSI development.
- Provide results of taking a fresh look at current OSI techniques, capabilities and equipment availability with suggestions for future projects.
- Provide informal guidance on an overall action plan for OSI development.
- Produce a report to be presented to the Thirty-Third Session of WGB. This report should clearly reflect common views and findings and present specific suggestions and recommendations as well as points for further consideration.

Zucca discussed the work programme and agenda for the workshop and introduced the six subject leaders. The programme of work comprised:

(1) Taking stock, lessons learned and current status of the OSI regime;

(2) Technical review and update;

(3) Workshop report drafting and providing guidance for an action plan.

Comments and Discussion

The discussion centred around the content and nature of the workshop report and its bearing on future activities. It was pointed out by several participants that this workshop report is not a formal WGB document, but rather a document intended to provide guidance and technical suggestions for WGB in developing an action plan for OSI development. This workshop also provided an opportunity to add new ideas for technologies and for guidance for further OSI development. It was agreed that there should be an attempt at consensus in the conclusions and that the report should not be lengthy.

Following the opening remarks, the workshop moved into the first of four sessions, consisting of:

- Session A: Review of Lessons Learned from the IFE
- Session B: Technical Review of the IFE
- Session C: Knowledge Update
- Session D: Guidance for Action Plan

The complete agenda, with names of presenters and titles of presentations, is included in Annex I to this report. A DVD containing viewgraphs from the presentations and other documentation is also available. The objective of this report is to provide a relatively brief summary of this workshop and summaries of the discussions. The summaries below are grouped according to theme, subject matter or technology and not necessarily in the order in which they were presented during the workshop.

SESSION A: REVIEW OF LESSONS LEARNED FROM THE IFE

The purpose of Session A was to set the stage for the later technical discussions by providing an overview of the IFE review and follow-up process, especially as it pertains to planning by the OSI Division of the Provisional Technical Secretariat (PTS) for 2010 and following years. Specific technical results of the IFE were covered in this workshop during Sessions B and C as summarized in later sections of this report.

To set the stage for presentations and discussions, Balczo provided an overview of the objectives of the IFE, which consisted of the following activities and objectives:

(1) The IFE involved the testing of actual procedures involved in an OSI:
   - Implementation of techniques that have been developed since 1997;
   - Simulation of some aspects of the time frame of an OSI;
   - Exercise of command and control, decision making, and procedures such as logistics, and setting up field laboratories and the base of operations.

(2) The exercise provided for an evaluation of procedures provided by the test version of the OSI Operational Manual (Test Manual) as well as field guides, technical handbooks and standard operating procedures (SOPs).

(3) Testing of the cooperation of the PTS Divisions and evaluation of the Lessons Learned Database were integral parts of the exercise.

(4) Evaluation of issues needed to further the ultimate goal of full OSI operational readiness identified from the IFE.

Lampalzer and Wang summarized the IFE review and follow-up process and related documentation (e.g. CTBT/PTS/INF.988). This consists of:

(1) OSI Workshop-15, held in December 2008, which provided a review of the results of the IFE. Refer to CTBT/PTS/INF.999, “Lessons Learned Report on the Review and

Follow-Up Process for the 2008 Integrated Field Exercise", and CTBT/PTS/INF.994, "Report of On-Site Inspection Workshop-15: 2008 Integrated Field Exercise".

(2) The Thirty-Second Session of WGB, held in February 2009, included an initial report of the evaluation team (refer to the Alamo and Guarnizo presentation of this workshop), and the report on IFE lessons learned (note that the evaluation team report is CTBT/WS/EVA/EVAL-17, "Report on the IFE Evaluation Reporting Workshop").

(3) OSI Workshop-16 (this workshop) held in May 2009 and the follow-up Extraordinary Session of WGB held in May 2009.

(4) Completion of the review and evaluation process with the Thirty-Third Session of WGB in August-September 2009.

In a second presentation, Lampalzer described some of the actions initiated by the PTS OSI Division following the IFE to address issues that were brought out by the field exercise experience. These included the following:

- Revisions to the Lessons Learned Database;
- Identification of lessons learned related to the design of the IFE and the scenario;
- Identification of lessons learned related to planning and preparation and management of the exercise, including observer participation;
- Identification of lessons learned related to health and safety, finance and administration, and media and public information.

Finally, Lampalzer identified a series of issues identified from the IFE experience that directly relate to needs for PMO guidance and action. These include:

- Guidance on parameters, scope and goals for a future major OSI exercise;
- Guidance on development of a public information strategy for OSI;
- Requirements for additional expertise within the OSI Division;
- Guidance on administrative and legal issues pertaining to the future status of inspectors;
- Guidance on health and safety and medical issues pertaining to future inspectors.

Alamo and Guarnizo provided an overview and highlights from the external evaluation report on the IFE together with an overview of the evaluation objectives, rationale and process. The evaluation findings and the answers to the evaluation questions were presented in a technology matrix form relating to OSI components (documentation, training, and equipment and infrastructure). It was emphasized that the main contribution of the external evaluation was to assess not only whether the IFE was "doing the right thing (and) doing it right" but rather "whether there are better ways to do it". Among the highlights of their findings were:

(1) The test version of the OSI Operational Manual proved satisfactory for the purposes of the exercise.

(2) Several issues needing clarification in the OSI Operational Manual were identified, such as:

- Definition of stages of the initial overflight;
- The role of inspected State Party (ISP) comments in the development of inspection team (IT) reports;
- The ability of the ISP to access the field information management system (FIMS).

(3) With respect to technical operations, the evaluation found that the status of the SOPs tested ranged from basic to fully developed and that:

- SOPs need comprehensive review for consistency with the OSI Operational Manual, etc.;
- SOPs need to be developed for some technical areas, such as ground based visual observation;
- FIMS capabilities and data flow concepts and procedures need further work.

(4) The evaluation noted areas for improvement in exercise planning, management and play; in infrastructure and logistics support and procedures; and in the training programme.

(5) The evaluation noted the importance of contribution in kind (CiK) equipment and noted significant issues related to meeting requirements and training on its use.

(6) The evaluation confirmed a need for a permanent and adequately staffed Equipment Storage and Maintenance Facility (ESMF) and the need for an Operations Support Centre (OSC) facility.

A final summary statement emphasized that “testing before development does not work”; in other words, techniques need to be developed and operational before it makes sense to try to test integrated operations in the field. The evaluation also included several recommendations for developing and testing in a piecemeal customized approach, e.g. through tabletop exercises and directed field exercises to confirm/measure progress.

(Note that during the IFE, samples were not taken off-site, some substitute samples were provided for analysis by the Kazakh hosts, and xenon noble gas measurements, gravimetry, active seismometry and drilling were not used.)

In a presentation related to the very important contributions of the host country (Kazakhstan) during the IFE, Belyashova provided an outline of what the host country provided for the IFE and noted some areas needing improved coordination in the planning and execution phases of the field exercise.

Three other presentations focused on the planning and preparation process that the OSI Division is currently conducting prior to the Thirty-Third Session of WGB and development of activities and budget for 2010. Prah provided an overview of the planning process of the future development of the OSI regime. He reported that the PTS has prepared a “must do” list which provided the basis for an update to the Medium Term Plan (CTBT/PTS/INF.992) as part of the input into 2010 planning and budget preparation. The objective of this planning process is to build up and sustain OSI capabilities leading to EIF. Prah also listed five “cluster areas” of OSI activities that have been identified as priorities for PTS activities:

- Cluster 1: Procedures and Documentation. Finalize the draft OSI Operational Manual; finalize OSI subsidiary documentation; develop procedures and techniques for multispectral imaging, noble gas sampling and obtaining full OSI operational status ("operationalization").
- Cluster 2: Equipment. Have available two sets of equipment.
- Cluster 3: Infrastructure. Put an ESMF in place; set up a permanent OSC and its infrastructure; develop a comprehensive database to support OSI.
- Cluster 4: Inspectorate and Human Resources. Develop the training and exercise programme; develop a roster of inspectors.
- Cluster 5: Operationalization. Develop an information flow process and infrastructure to support it; develop a rapid deployment system; improve communications; develop confidentiality policies.

Lampalzer also described how the way ahead for future planning included development of a comprehensive action plan by the PTS that will be developed between May and August of 2009 and presented at the Thirty-Third Session of WGB. This action plan will include guidance from this workshop (OSI Workshop-16) as well as guidance from the PMOs. The plan will consist of concrete proposals for future implementation. Kvok expanded on Lampalzer's presentation, pointing out that the PTS has taken a programme management approach to planning for 2010 that is based on the IFE lessons learned assessment (CTBT/PTS/INF.999), guidance from the Thirty-Second Session of WGB and guidance in CTBT/PTS/INF.992, "Update to the Medium Term Plan: 2009-2013". As a result of this process, the high priority issues listed as the "clusters" above have been identified and the structure of the OSI Division has been modified to follow these priority subject areas.

Discussion and Comments

- Questions were brought up about task force groups to facilitate future exercises. The PTS informed participants that work on the development of a future exercise guidance document has been initiated that will take into account the lessons identified from the IFE and include operational, administrative and organizational issues such as the definition and responsibilities of task force groups.
- Some participants raised the issue of whether external evaluators should review the entire preparatory phase of an exercise rather than just the execution phase as was done in the IFE. In another question about observers, it was pointed out that contingencies of weather forced many of the State Signatory representatives to be regrettably evacuated to Kurchatov City, which reduced their opportunity for observation.
- The development of a list of detailed responsibilities and arrangements to be made by the ISP for an OSI should be considered. The development of a model text could be a possible option for further consideration.
- The need to distinguish between the responsibilities of the ISP during an OSI and those of a State hosting an exercise was stressed.
- It was recognized that the development of a comprehensive scenario, which would allow validation of all OSI techniques in an exercise, is a considerable challenge and it

was noted that ISP/host country support is critical for the successful conduct of an OSI/exercise.

- Some participants noted the many positive issues that arose from the IFE. Suggestions were made for additional issue clusters identified in the lessons learned process. In this context, Lampalzer informed participants that the review and follow-up process was deliberately designed to be transparent. All IFE observations are recorded in lessons learned logs and will be incorporated in the revised Lessons Learned Database, which will also cover lessons from previous exercises. These observations were to be made available on the IFE/Experts Communication System (ECS) platform for the Extraordinary Session of WGB that immediately followed this workshop.
- It was pointed out that no accidents occurred during the IFE and in any case operation/survival under extreme conditions was not one of the IFE's objectives. Melamud reminded participants that aspects like camp life need to be included in the training programme and will be covered in the second training cycle. However, he also noted that synergy of OSI techniques is not developed enough at this stage for OSI techniques to be tested in extreme conditions.
- OSI readiness encompasses several aspects that need to be considered, and defining OSI readiness is an important and closely related issue that should be included in work on milestones for further OSI development.
- Discussion arose about the number of full sets of equipment required at EIF. In this context, the need for separate equipment for training purposes was reiterated. Additionally, it was stressed that an ESMF needs to be put in place as a prerequisite before the purchase of entire equipment sets.
- Equipment related discussions also briefly touched upon the issue of buying versus renting equipment for drilling and active seismic methods.
- Discussions also touched upon the need for an OSC and related infrastructure, including databases.
- Participants recognized the need for additional expertise and staffing in the OSI Division. Kvok reminded participants that OSI is the smallest PTS Division and that no increase of posts in the OSI Division is currently feasible. The Division believes that the use of consultants for both long and short term projects temporarily alleviates this problem.
- Some discussion centred on planned OSI workshops, in particular on drilling. In this context, a proposal for a combined workshop on both drilling and active seismic methods was made. In addition, some participants noted that drilling aspects could also be discussed in a workshop dedicated to inspection techniques.
- Kvok provided some explanations on the planned directed exercise for 2010; this directed exercise will focus on communications and ground based visual observation.
- The challenge for further building up the OSI regime after the IFE was discussed in terms of continuing the development of the different components and elements through directed exercises, equipment testing and training of surrogate inspectors. It was suggested that the process focus on explicit and systematic integration among those components and elements, strongly driven by the processes for implementing an

inspection (preparation, launch and field activities), together with a proper measurement system that allows tracking progress and readiness level in developing the OSI regime.

- Participants also addressed and discussed the need to give full consideration to the objectives of future large exercises when designing and implementing the scenario and the importance of incorporating the evaluation function as early as possible in their planning in order to ensure clarity and measurability of the objectives.
- Political will of States Signatories is considered crucial in the further development of the OSI regime.
- Some discussion evolved around the required level of self-sufficiency of the IT. In this context, the close linkage to the concept of readiness was noted. In addition, participants noted that self-sufficiency of the IT is not stipulated in the Treaty: a key question is to establish the area where the IT should be self-sufficient. Reference was also made to the practice of other international organizations and the concept of outsourcing logistical support issues, such as the maintenance of operating a base camp. Once more, the need to establish standing arrangements between the future Technical Secretariat, service support providers and States Parties was highlighted.
- A number of comments were made on the need to "operationalize" the OSI regime. An overarching strategy that allows the rapid conduct of actions by the different Divisions in the PTS and their interaction needs to be developed and put in place by the PTS.

SESSION B: TECHNICAL REVIEW OF THE IFE

Presentations in this session came from members of the OSI Division of the PTS. The purpose of this session was to provide an overview of the technical and operational aspects of the IFE as a general reference for the rest of the participants and to provide a focus for the presentations and discussions in Session C.

Arndt started the session by stating that over 70 lessons learned (out of more than 800 overall) were identified during the IFE that were related directly to technology application. He reported that the PTS has developed a quantitative rating system to assess the status of OSI technology development. The technologies considered include: the Seismic Aftershock Monitoring System (SAMS); continuation period techniques (CPT); information technology management; data analysis; logistics; noble gas and radionuclide measurements; sampling methods for gas, liquids and solids; active and passive seismic methods; multispectral measurements; and gravity and magnetic measurements. The rating system consists of six levels of development:

0. Not started.
1. Used ad hoc, poorly controlled, reactive process.
2. Developed partially, process often reactive.
3. Adequately developed and process proactive.
4. Fully developed and controlled, quality control applied, synergies with other technologies.
5. 100% integration and continuous improvements.

Of the OSI technologies currently being developed, several are in the zero category (not started) and the highest category reached is level three (SAMS). This rating system should prove very useful as a measure of the status of technology development for OSI.

Labak provided a review of the current status of SAMS, currently the most robust of the OSI technologies. Constraints for this technology include the need to detect to magnitude -2.0 seismic events, the basic knowledge that the aftershock rate decreases rapidly following an underground nuclear explosion (UNE), the objective of using aftershock monitoring to narrow the search area, and the need for the efforts of up to 10 IT members during the initial period to field seismic instruments and begin the data analysis. During the period 2002-2008 improvements in the system were developed that include development of a mini-array concept for deployment that lowers detection thresholds, hardware and software development, and creation of process and procedures templates to enhance the efficiency of field deployments. What still needs to be developed are streamlined screening and analysis methods and quality control tools. The testing of further improvements in the system will take place during several directed field exercises. One is currently scheduled for July 2009.

Tanaka provided a review of the status of radionuclide measurement equipment. He pointed out that all of the radiation survey equipment used during the IFE was either rented or a CiK, with the exception of four handheld gamma radiation monitors equipped with an isotope identification function. However, these monitors do not display energy spectra and can only be used to identify specific allowed radionuclides; thus some radionuclides were misidentified because of the information barrier. This illustrates some of the problems that can arise from blinded systems. What is urgently needed for radionuclide measurement is a blinded (e.g. information barrier), mechanically cooled high energy resolution germanium gamma spectrometer that can be used in the field. To accomplish this, the list of allowed radionuclides for OSI will have to be approved (by the PMOs) and equipment with the proper requirements will have to be developed and acquired. In the area of sampling and analysis, there are great challenges to be overcome because current systems cannot analyse samples fast enough to keep up with the number of samples expected to be encountered during an OSI. There is also a need to develop “sampling kits” for collection of gas, liquid and solid samples, along with development of a sampling methodology. There currently is no operational method for analysing noble gas in the field during an OSI. The argon system provided by China for the IFE shows great promise, but it needs to have a higher sensitivity and be more field-ready. Tanaka estimates that the radionuclide system for OSI overall is only about 10-15% developed. Greatest needs at this time are for an allowed radionuclide list, equipment and more human resources in the PTS.

Gaya-Piqué reviewed the current state and future requirements of CPT. Equipment for ground based measurement of magnetic and gravitational fields, equipment for ground penetrating radar (GPR) and equipment for shallow and deep conductivity measurements have been acquired by the PTS. The process to acquire equipment for resonant and active seismic measurements, airborne geophysical equipment and drilling equipment has not yet been started. During the IFE ground based magnetic methods were found to be good at detecting ferrous borehole casings and buried artefacts, while airborne magnetic methods proved to be more useful for characterizing local geology rather than detecting individual borehole signatures. The GPR and shallow conductivity equipment are mainly used for looking for shallow-buried artefacts. Plans are being made to test equipment for carrying out deep-probing electrical conductivity measurements (equipment from Zonge Engineering and

Research) during a directed field exercise later this year. For CPT, the PTS still has a very strong dependence on CiK equipment; what is needed for the future are software for geophysical data analysis, better knowledge of the kind of geophysical signatures from UNEs to be expected from various technologies, and PMO guidance on active seismic and drilling technologies.

Abushady reviewed the status of the FIMS and the communications capabilities for support of OSI. These two systems are very important for use prior to, during and at the end of an OSI and are closely linked in their operational aspects. During the IFE, two-way radios were, inter alia, used for communication between the IT and the base of operations, but these were found to be inadequate in several ways. The FIMS used is only in its initial development, and many opportunities for improvement of both the FIMS and communications have been identified as a result of the IFE. Many of these improvements require guidance from the PMOs, including the need for additional PTS human resources and additional training for IT members on the use of the FIMS and communications. Several other development and equipment acquisition needs were also identified (refer to the viewgraphs from Abushady's two presentations).

Tweed described the OSI documentation management system (OSI DMS). This is a centralized and coordinated documentation system within the OSI Division. Objectives of the system are user-friendliness, consistency of formats, quality assurance and central archiving with maximum transparency. The document naming system classifies documents by type and activity/topic. There is a searchable interface to the system that allows easy access to several different types of documents, such as the Treaty, the latest draft of the OSI Operational Manual, the IFE Test Manual, SOPs, user manuals, etc. Follow-up on documents submitted to the system includes content review and technical review.

Anderson described the process of preparing for and executing the huge task of logistics support for the IFE. He described the process of procuring logistics services and the various agencies that had to be coordinated, drawing heavily on experience gained from four previous field exercises. Equipment included contributions in kind from several different countries that had to be coordinated for shipping both to Vienna and from Vienna to the home country, and to and from Vienna to the field area. Cargo costs for the IFE and equipment for the base of operations were covered by the European Union. Anderson listed a number of documents, developed before and after the IFE, that provide logistics guidance. Key conditions for success in an OSI field deployment are advanced preparation and readiness, rapid initial deployment, sustainability of support and reactivity according to circumstances. Some important components needed for the support of future full scale OSI exercises (as well as for EIF) are an ESMF, an OSC, a comprehensive database and ongoing arrangements, and basic elements for the base of operations. As a final statement, Anderson said that the IFE showed that currently the logistical system is not yet developed enough to run or sustain an OSI anywhere in the world in the time frame of the CTBT, but also showed where the weaknesses in the system lie and strengthened the justifications for speedier development of some parts of the system. He also pointed out that a logistics and operational support team now exists in the OSI Division to concentrate on all issues inherent to the continuation of the development of the logistical system.

Millon provided an overview of his concept of data flow for OSI. This concept consists of recommendations for development of SOPs and descriptions of blocks of activities that define daily activities in order to coordinate planning by the IT and briefings for the ISP. The data

management tool is based on geographically referenced information that is regularly updated, reference log sheets and archival of raw data. The main objective is to support development of the final OSI IT report to the Executive Council and enhance confidence between the IT and the ISP. Key elements of the system are archiving, visualization and information sharing, transparency and security of information. He outlined a plan for a project to develop this system over a period of about 18 months using existing PTS human resources and about three months of consultant time. The project could be tested in late 2010 to integrate it with the FIMS and communication system using a local area computer network (LAN). The implementation of this plan will directly impact IT planning, the reporting and archiving process, search logic of an OSI and the daily organization of IT work.

Comments and Discussion

- In response to a question about availability of information from the International Data Centre (IDC) during the IFE, Labak noted that information on the OSI triggering event was available, but in general the issue of interaction with the OSC/IDC needs to be considered in the future, including inclusion of other information about the inspection area, such as geology.
- The question of use of telemetry for SAMS arose, and Labak said that options of surface and satellite telemetry are currently being considered, but there is currently no telemetry capability for SAMS.
- One participant suggested that the SAMS concept of the PTS is too ambitious. The role of SAMS is to narrow the search area, not to determine the yield of the triggering event. Labak replied that the SAMS objectives are focused on aftershocks, not the triggering event.
- There was extensive discussion about the number of samples that need to be dealt with for radionuclide analysis. Comments suggested that sampling should be driven by search logic and the need to define anomalies, although another suggestion was that the number of samples should not be limited.
- Comments also centred on alternatives for testing detection of radioactive contamination during an exercise without real sources and the need to avoid CiK equipment.
- There was also discussion of the need for operational procedures for radiological sampling and the need for inspectors to be trained for radiological health and safety.
- It was suggested that the IFE revealed that currently the radionuclide sub-teams do not have the capability to identify anomalies and background radiation for radiation safety. This is an equipment and operational issue that needs to be addressed.
- In response to questions about scope and readiness of CPT equipment, Gaya-Piqué pointed out that only six days of the continuation period were exercised during the IFE and that several of the CPT technologies, including gravity, were not exercised. There is a need for analysis software and knowledge of geophysical signatures for all of the CPT. The value of airborne magnetometry still needs to be demonstrated; equipment used during the IFE was CiK.
- The use of a mobile FIMS, and its distinction from a fixed FIMS, were discussed. A mobile FIMS is important to make the job of inspectors easier, but there are the

important issues of review by the ISP, backup, security, etc. There are also issues about how to incorporate the FIMS into routine operations and how it should be used for report preparation and data archival. Abushady noted that the PTS is currently working on SOPs for the FIMS.

- It was pointed out that there is a lack of definition and scope of the FIMS and that such issues should be addressed in the OSI Operational Manual.
- Arndt noted that the FIMS will be exercised in a directed exercise in Finland at the end of July.
- In reply to a question about the use of the FIMS in decision making, Prah pointed out that the FIMS is not an expert system but is only used as a sophisticated visualization tool.
- One participant suggested the incorporation of Bayesian statistics for decision making and training.
- Questions arose about field cards/guides naming and whether a list of SOPs exists. Tweed said that there are currently nine plastic field guides that outline SOP procedures and that there is a table of existing SOPs in the OSI DMS.
- Tweed pointed out that printouts and disks of the OSI DMS and documents contained in it are available on request, and that Web access to the OSI DMS will be looked into. There is no technical software to search for documents, as they can be easily found via the interface or the document folder system.
- Several comments about communications centred around Internet access, communication with the Director-General, confidentiality, etc. Abushady said that concept documents are being prepared to deal with many of these issues; the LAN was only used at the base of operations during the IFE, with no access to the external network.
- Comments on Millon's presentation centred around how software would be shared and how to control and coordinate data. Millon replied that the data tools have to handle many formats and be as flexible as possible; for each team there would be a plan subject to ISP agreement with tracking of plan status.
- One participant suggested that needs of the ISP and needs of security are still missing in the data flow concepts.

SESSION C: KNOWLEDGE UPDATE

Session C provided an opportunity for experts from outside of the PTS to add their perspective to the conduct of the IFE and lend their expertise to provide ideas for new or alternative approaches to OSI technologies. The summary of presentations below is grouped according to the OSI technology being discussed, rather than in the chronological order of the presentations. For details of the presentations, refer to the presentation viewgraphs that are listed according to the presenter's last name.

Overflights, Visual Observation, FIMS, General Strategy of OSI

Ludwig reviewed overflight experience from the IFE. The flight plans that had initially been prepared in Vienna by the IT had to be revised significantly because of no-flight zone and low flight zone restrictions imposed by the ISP. The areas Ludwig noted that need improvement are: expertise of team members; documentation, including the use of templates; development of flight planning software; and the need for an advanced course in visual observation utilizing focused exercises. Walker introduced the novel idea of the possibility of using unmanned aerial vehicles (UAVs) during an OSI. He reported on the results of a Royal Society workshop in 2007 that discussed the role of UAVs as a platform for radionuclide detection technologies. Systems are already available to carry out radiation measurements, and such systems could also be used for magnetic and multispectral applications. These technologies are not prohibited by the CTBT, but does that mean that they could be permitted? Walker reviewed the pros and cons of UAV application to OSI: pros – safety, autonomy, faster transfer of information, full coverage of inspection area, manoeuvrability; cons – acceptance by the ISP, training, cannot currently be used for CPT.

Kuang presented his concept of a practical strategy for visual observation. He stressed the synergy of methods and showed examples of visual phenomena associated with underground nuclear testing, such as tracks from heavy equipment, engineering artefacts and examples of boreholes, cables, roads, prepared ground, mud pits, fencing, rock falls, etc. He stressed that inspectors must master knowledge of general UNE phenomenology and outlined a strategy for conducting visual observation. Wohletz presented a concept for the FIMS, emphasizing its importance for data flow and integration. Important features of the system that Wohletz described are the use of portable hardware, incorporation of data analysis and display capabilities and use of a centralized data repository. Abdul Hafez presented a general overview of the OSI process, emphasizing safety and security, the use of checklists, and hazards involved with the use of lead-acid batteries for portable power. Henderson provided an overview of the use of multispectral methods during an OSI. He pointed out that the most effective use of multispectral imagery is from an airborne platform, looking for features such as vegetation stress, ground spectral signatures such as varnish (a weathering effect), thermal effects of disturbed ground, and to support geological mapping. He proposed a series of demonstration experiments to test concepts and equipment that would lead to guidelines for selecting equipment and prescribing procedures.

Radiological Measurements and Sampling

Bowyer provided an overview of issues related to noble gas sampling for OSI. He pointed out that release from a UNE could occur by direct venting or slow seeping, with concentrations at the becquerel/cubic metre (Bq/m^3) level (much above minimum detection levels). Bowyer noted that the PMOs have not yet designated detection limits or equipment requirements for noble gases. He showed results of calculations of expected concentrations of argon and xenon isotopes as a function of time and discussed issues of detection limits. He pointed out differences between atmospheric (as for the International Monitoring System (IMS)) sampling for noble gas and subsurface sampling, as is done during an OSI, and discussed sampling issues and how noble gas sampling fits into the overall strategy of narrowing the search zone during an OSI. Finally, he recommended forming a subgroup to deal with OSI noble gas issues, similar to the one formed for a similar purpose for the IMS.

Zhang reported on the experience from the IFE of the fielding of a portable ^{37}Ar analysis system that was a CiK by China. He noted that some of the operational problems encountered during the exercise resulted from lack of coordination, logistical support, etc., while others were related to the system itself, such as the field sampling apparatus. The Chinese group will continue to work on development of the system, which is close to meeting OSI requirements, such as improving sensitivity and reliability and improving the sampling apparatus.

Dougan provided a survey of different types of radiation detectors for near term and mid- to long-term radiation protection, noting limitations of sodium iodide (NaI) detectors and high purity germanium (HPGe) detectors and their relative spectral capabilities. Of note was her suggestion of using electronically simulated sources for training exercises, which have the advantage of not requiring actual radiological sources and the ability to inject data for field simulation or training purposes. She also noted the need for a spectral blinding capability for high resolution systems.

Milbrath addressed radionuclide sampling and detection concepts, making parallels between radionuclide sampling and sampling typically used for environmental remediation. He pointed out that sampling procedures like these are routinely carried out during inspections by the International Atomic Energy Agency (IAEA). Milbrath also reviewed detection data from past US underground nuclear tests and related these to information that might be available at the start of an OSI (e.g. estimated yield and depth of burial) and how the OSI search process could proceed. As was pointed out in other presentations, he emphasized the need for better cooling systems for HPGe detectors, the need for a list of allowed radioisotopes, detector calibration issues, and the need for additional studies of sampling and sample throughput into the various analysis systems.

Continuation Period Technologies and Drilling

Sweeney reviewed some essential aspects of aftershock monitoring: the differences between earthquake and explosion aftershocks in the types of waveforms typical of each source and respective location patterns of events. He described some of the issues related to passive and active seismic surveys to look for the explosion damage zone and suggested that contractors, or inspector assistants, be considered for the complex task of performing an active seismic survey. Sweeney also proposed short-notice, short-term deployments in a region following a relatively small earthquake as a way to exercise the SAMS capability, either before or after EIF.

Gong focused on the issue of application of geophysical methods to survey shallow versus deep targets. Shallow methods mainly are useful for detection of shallow-buried artefacts (less than 100 m), while deep methods are used to detect the underground disturbance zone of the explosion. He noted that methods for deep targets, such as transient electromagnetics (TEM) and controlled source audiomagnetotellurics (CSAMT), and active seismic methods have not been tested enough and effectively. Understanding of explosion phenomenology and the effect of different testing scenarios is needed. He recommended that a series of directed exercises be conducted to address this important part of the OSI regime.

To end the session, Hawkins provided a survey of US test programme experience with drilling – what it involves, use of directional drilling, logging, sample handling and special issues for drilling in the OSI context. He emphasized the importance of all of the OSI phases

leading up to determination of the drilling target. In his summary comments, Hawkins pointed out that "drilling typically involves a number of subcontracts for specialties and supplies…and drilling capabilities and experience varies – special capabilities will be required".

Comments and Discussion

- Discussion of airborne visual observation focused on the identification and definition of observed anomalies. It was agreed that visual observation expertise is critical for OSI and guidelines are needed for integrating this into the search logic.
- Discussion of multispectral/infrared (MS/IR) technology was related mostly to UNE phenomenology and what might be observed, best flying times, time needed to assess data, etc. Henderson noted that signatures change with time of day and decrease with distance, so measurements should be made at different times of day; there should also be consideration of resolution versus sensitivity. Since MS/IR may not have the opportunity for use on an additional overflight, tethered balloons and UAVs were discussed as other deployment options. It was agreed that MS/IR technology has great potential, but demonstration experiments are needed to assess this potential.
- With respect to the UAV presentation, the discussion concerned the issue of whether it would be allowed by the ISP and whether multiple platforms could be used, but there was general agreement that this technology has potential to resolve many safety, access and flexibility issues unique to an OSI.
- It was suggested that Kuang's presentation form the platform for drafting sections of the OSI Operational Manual concerning visual observation. There was general agreement that there is a need for documentation of visual observation phenomena, with suggestions on how to determine what is an anomaly – something beyond the range of what is to be expected.
- In response to a question about training needed for noble gas measurements, Bowyer noted that it should only be for sub-team members and could take extensive training to ensure high-confidence measurements.
- Other comments about noble gas measurement concerned the measurement process and sampling. Bowyer noted that transport modelling should be used with targeted sampling (tree roots, fractures, faults). Throughput of the analysis system will have to be considered in system specifications.
- In response to a suggestion to include radon sampling in the process of noble gas sampling, Bowyer said that it deserves more systematic thought. There were also questions about ^{37}Ar production from calcium near a UNE (a few per cent calcium is enough), calcium production from concrete (unknown) and how it is produced (as single atoms).
- Comments were also made that the portable argon system used in the IFE is a very positive step, but there are calibration issues with its use at present.
- There was a question about how realistic data could be injected into an HPGe spectrometer for exercises or training. Dougan suggested that a wireless interface with a card or chip could electronically create a virtual spectrum. Bowyer pointed out that such an approach has been used by the IMS.

- Tanaka noted that the allowed radionuclides have not yet been defined by WGB and that software and hardware for blinding still need to be developed.
- In a discussion about software (for blinding) acceptability between the IT and the ISP, Melamud noted that this problem has been resolved before by having pre-approved software in Technical Secretariat custody that is only checked during the OSI.
- There was additional discussion about the details of accomplishing blinding. Milbrath indicated that there is currently no guidance as to what parts of the spectrum are not allowed for analysis and how specific anomalies can be identified. He also said that blinding for NaI systems has not been studied, but is probably no harder to implement than for germanium systems.
- There was also an extensive discussion of sampling strategies and search logic with respect to radiological methods. Both Milbrath and Bowyer emphasized that surveys for anomalies should precede sampling. Milbrath suggested a five part approach to radionuclide issues for OSI: planning, blinding issues, modelling, radiation detectors and strategy development.
- Much of the discussion of the FIMS revolved around issues of confidentiality and how a FIMS could deal with the IT-ISP interface and whether any prototype systems have been developed outside the PTS. Wohletz indicated that his presentation basically was conceptual. Suggestions for resolving some of these issues included passing everything to the ISP, using templates and avoiding the use of the FIMS as an expert system. Use of a portable, electronic system is essential.
- Discussion of CPT geophysics revolved around defining the target and the difficulty of characterizing deep targets. Gong indicated that the target is the UNE borehole, explosion cavity and rubble chimney associated with cavity collapse. There was general agreement that modelling for different types of scenarios would be a good first step to assess possible performance of CPT methods.
- For the drilling presentation, there was a lot of discussion about cost and technical details. Hawkins indicated that drilling could be quite expensive, and that techniques used in industry could be readily adapted to OSI, but there will be some specific differences. For example, if a drilling company drills into a contaminated site, the TS may have to buy the drilling equipment afterwards. Hawkins noted that radionuclide samples could be recovered by drilling into only the rubble chimney, which may be an easier target.
- Other discussions of drilling dealt with sampling (where and how); Hawkins suggested that a gamma log might be sufficient for proof of a UNE. It is not clear what information (such as CPT survey results, surface visual observation, etc.) will be sufficient to justify drilling.

SESSION D: GUIDANCE FOR ACTION PLAN

In this session, there were two presentations on preliminary planning being carried out by the OSI Division (equipment and training), as well as some summary perspectives on the overall OSI regime and its state of readiness. The presentations by the workshop co-chairpersons,

Shchukin and Zucca, dealt with the specific planning process for the OSI regime and a perspective on overall readiness for EIF.

Specific PTS Planning

Arndt outlined equipment and implementation issues for 2010 and beyond. The long term goal is for the PTS to procure the core and auxiliary equipment necessary to conduct OSI without using CiK equipment, with complete integration and continuous improvements for all of the core equipment. He outlined a strategy for SOPs, procurement and test exercises to begin to reach these goals. Guidance from the PMOs is critical, with specific guidance needed in the areas of: digital still photography; blinded radionuclide spectral measurements compatible with quality assurance, calibration and field safety; global positioning instrumentation and absolute coordinates; and information from satellite imagery. He pointed out that the delay between definition of requirements, procurement and actual acquisition of equipment can often be more than a year, and this is important to consider for EIF. A chart in his presentation showed how the process must start now if EIF is to be considered as early as 2013. He presented, via several viewgraphs, his preliminary breakdown of financial and human resources needed for the development of each technology area to the end of 2012.

In a presentation on another aspect of OSI Division planning, Melamud reviewed preliminary plans for the revised training programme, based on IFE experience. He reviewed the training cycle for the IFE and pointed out that considerable time is needed to complete a full training cycle leading up to a large exercise, and that this needs to be considered in the overall planning process. Difficulties were encountered because not all the documents, procedures and equipment were available for the courses prior to the IFE. He reviewed some of the electronic training content that has been developed and what is currently being worked on. He reviewed the lessons learned from the IFE and provided a comparative list of additional training that was requested as a result of Workshop-15 and by the external evaluation team, and showed that an initial minimal estimate of the additional training requirements would add six weeks to an abridged six week cycle used for the IFE. Basically, this means that the training cycle needs to start about three years in advance of the next major field exercise. He outlined a number of additional training options, many dealing with specific field technologies, and presented a series of training cycle options for consideration, with possible time lines.

General Perspectives

Li provided his perspective on the IFE and OSI technology development, stating up front that the IFE was a “basic success” because of the accumulated wealth of experience and because of what can be gained from the shortcomings that were revealed. His comments covered the scenario design, setting, search logic and the readiness of OSI technologies. He noted the lag of OSI capabilities behind those of the IMS and IDC, but pointed out the complex technical issues particular to OSI that have led to this situation. Now, higher priority needs to be given to OSI technologies. He made a series of suggestions for the development of OSI techniques:

- Phenomenology should be compiled using information and data released by the P5.
- The visual inspection experience base should be assessed and documented.

- Noble gas technology for OSI is different from that of the IMS, physical mechanisms for gas leakage need better understanding and specific sampling and analytical methods need to be developed.
- Geophysical techniques are focused on finding sampling and drilling targets, and the effectiveness and limitations of each method need to be addressed, along with data processing techniques and study of synergy of methods.

Ichimasa gave his perspective on lessons learned from the IFE and capacity building for future OSI readiness. He noted issues such as the scope of the exercise and what was revealed about current OSI capabilities, including logistics, administrative and documentation successes, but with too much reliance on CiK equipment. He then focused on the issue of OSI readiness, suggesting that it could be a scorecard for the current capability for conducting an OSI. He presented definitions for levels of readiness before and after EIF and brought up the issue of whether the OSI regime needs to maintain a capacity to carry out two simultaneous OSI campaigns. Finally, he outlined a capability based approach to OSI readiness and provided some ideas about different kinds of deterrence that might apply to OSI readiness.

Comments by the Workshop Co-Chairpersons

Shchukin reviewed the process of the initial development of OSI milestones, consisting of the six elements for development (methodology and technology, documentation, infrastructure, equipment and software, testing and validation, and training) and the final objectives for these elements. The final objectives were to be reached via a seven step plan, with the final step being EIF. That strategic plan for development of the OSI regime is documented in CTBT/PTS/INF.793. Currently, there is a need to update and revise the OSI milestones via WGB guidance and discussions in the ECS. The key is that all of this needs to be focused on where the OSI regime is now and how it will progress towards EIF. Shchukin proposed a "level of readiness" approach to OSI milestones, consisting of "Initial", "Interim", "Advanced" and "Full" readiness levels. Refer to the viewgraphs from this presentation for the definitions and details of these designations.

In the final workshop comments, Zucca stressed the importance of the top-level goal of developing and testing a credible OSI regime. The goals should be broken down into steps that can be followed. The original milestones are still good, but they need to be periodically assessed and reported on and measured against the goals. He suggested that the "must-do" list is a good set of milestones. His perspective on specific system considerations is as follows:

- Development of the OSI regime should be viewed as a whole.
- There should be one consistent set of system elements.
- We should be able to describe steps leading towards a desired capability – at EIF there will at least be an initial capability.
- A level of readiness concept needs to be integrated with programme elements (refer to the chart in his presentation).

Finally he noted some useful concepts that have emerged from this workshop: core versus auxiliary equipment, the concept of "key" equipment for use in any scenario, with some

priority level for application of techniques; “chasing aftershocks” to test the ability to react rapidly with SAMS; and the idea of developing an atlas of signatures and observables.

Comments and Discussion

- Discussion about the training cycle included issues of the length of time of the training cycle (the sequential nature of the subject matter drives much of it), problems related to training without documentation or equipment, and the details of how qualifications of inspectors are assessed and how their readiness is assessed. Melamud indicated that these are difficult issues, but they are being considered and addressed.
- There was vigorous discussion about the concept of deterrence following Ichimasa’s presentation. One participant suggested that it was too early to discuss deterrence, but rather the focus should be on preparing specific tasking for the OSI Division. Several participants suggested that field exercises of limited scope would be important to demonstrate readiness; others had questions about how readiness might be quantified or whether it would be useful to do so. In response to a suggestion to define a minimum level of deterrence, Kvok suggested that this might lead to misidentification of the most important needs for OSI readiness and that maximum effort should be placed on ensuring full OSI readiness.
- Zhang’s presentation provoked discussion about the idea of acquiring more information on UNE phenomenology. One observation was that a general picture of phenomenology already exists in the annex to the draft OSI Operational Manual; what is needed is examples of data that are related to specific techniques. If old data are not available, new exercises are needed to collect such data.
- Discussion following Shchukin’s presentation concerned the nature of the planning process and Walker’s readiness concept that has been posted for ECS discussion. One suggestion was to cross-compare (via a “matrix approach”) the effectiveness of an OSI technique with its maturity (level of development) in order to arrive at priorities. Coxhead pointed out that the development plan must have (1) objectives, (2) a process, or road map, to reach the objectives, and (3) an evaluation, or means of assessing the progress to meet the objectives.

Following the conclusion of Session D, breakout groups were formed to meet under the guidance of respective subject leaders to formulate final findings and conclusions. The results of these breakout sessions were presented in a final workshop session for all participants for discussion and consensus. The results of this process are presented below for the technology areas under the sections “Basic Findings” and “Continuing Issues”. Results of the Future Planning group, facilitated by Shchukin and Zucca, are presented below under the heading “Future Planning”. This last section is intended to provide States Signatories with a series of suggestions for their consideration during the upcoming planning and budget process to be addressed during the Thirty-Third Session of WGB.

BASIC FINDINGS

IFE Lessons Learned
(Subject leaders: Lampalzer and Balczo)

- There is a need for additional expertise and sufficient staffing in the OSI Division in order to move the OSI regime towards operational readiness.
- Development of a guidance document from WGB for future exercises is welcomed and imperative.
- The workshop recognizes the importance of having detailed written contractual arrangements with the host State when preparing an OSI field exercise.
- The value of an external evaluation approach was recognized as a means to provide a systematic and external perspective for the learning process involved in any exercise or development activity and to contribute to the quality assurance platform for the OSI regime.

Technology Review
(Subject leaders: Arndt and Labak)

- More information is needed on signatures relevant to UNEs for most of the OSI technologies. Historical data should be made available, and support should be given to the PTS to conduct field testing and directed exercises at relevant places along with participation in specialized workshops and providing an overview of open sources.
- OSI technologies should be reviewed by prioritizing future development based on maturity, effectiveness, etc. A matrix evaluation of OSI technologies that assesses effectiveness versus current status, along with defining ways to achieve an acceptable level of readiness, is recommended that takes into account IFE evaluations and lessons learned.
- A systems approach should be developed in order to put the OSI regime into full operational status.
- Additional resources are critical for further development of OSI capabilities. These include additional staff for the radionuclide, health and safety, field information management, communications, operations and visual observation areas. Inclusion of cost-free experts and consideration of long term CiK equipment should be considered.

CONTINUING ISSUES

IFE Lessons Learned
(Subject leaders: Lampalzer and Balczo)

- The existing OSI Lessons Learned Database should be merged with current work on the the IFE review and follow-up.
- The Model Text (OSI Operational Manual) should be developed regarding standing arrangements with the interested States Parties.
- The evaluation team should be involved in the preparatory phase, including training, for the development of future large scale exercises.
- The PTS should develop an overall strategy to allow rapid organizational response in the case of an OSI.
- A sufficient set or sets of OSI equipment need to be available at EIF. This should take into account the need for calibration, maintenance, training and testing.
- A separate technical workshop on drilling and active seismic methods should be conducted.

Technology Review
(Subject leaders: Arndt and Labak)

- Specific technologies and issues identified are as follows:
    - Radiological measurements and noble gas sampling and detection: more development and testing is needed; PMO decisions on the allowed list of radionuclides and instrument blinding issues are urgently needed; a sampling strategy needs to be defined; consideration of training on virtual sources should be considered; and it is suggested that a special technical group be created for Investigation of Noble Gas for On-Site Inspections (INGO).
    - Visual observation methods will benefit from more knowledge on signatures typical of underground nuclear testing, and development of MS/IR methods should be started.
    - Development of active and resonant seismic methods should be started, and all continuation period techniques will benefit from systematic modelling efforts to estimate the types of anomaly signatures that are possible.
- The PTS needs to develop the capability to launch and conduct a large scale field activity, which includes rapid deployment and sustaining the IT.
- Information technology functionality, such as developing a data flow concept, linking communications, etc., needs to be developed.

FUTURE PLANNING

The objective of this section is to summarize the presentations and discussions of this workshop into a form to provide possible guidance for actions for the next stage of OSI build-up with emphasis on technical issues. The focus here is on a PTS action plan for OSI development following the IFE. The ultimate aim is to achieve a credible OSI regime as an effective verification component of the CTBTO.

Specific Suggestions

(1) Possible approaches to the development of the OSI regime for the period prior to EIF and sustainment of a credible OSI capability after EIF:

- Optimize development of OSI capabilities further;
- Develop refined measurable milestones/criteria;
- Review self-sufficiency requirement levels and options for the IT to execute its inspection mandate;
- Identify resource increase requirements to match with the development, including staffing and the option of using cost-free experts;
- Develop priorities for OSI development by evaluating a matrix of inspection techniques, with parameters including effectiveness, maturity and cost sustainability, noting that some techniques will always be required regardless of scenario;
- Integrate an operational capabilities assessment approach as a way of achieving synchronization and coherence between various OSI elements;
- Consider the value of a tiered approach to grade levels of operational readiness;
- The PTS should develop its part of the strategic plan and action plan in accordance with the revised OSI milestones and PMO-defined priorities and mandated resources.

(2) Suggestions of high priority technical areas where further steps need to be taken (in the form of projects):

- Phenomenology and signatures related to specific inspection techniques;
- Visual observation and multispectral/infrared imagery;
- Radionuclide measurements and sampling; noble gas isotope measurement and gas sampling;
- Continuation period techniques, especially geophysics;
- Data processing techniques and data mining.

(3) Advice on plans for obtaining and testing OSI equipment:

- Timely availability is essential, with consideration for procurement and training time lines;
- If possible avoid the use of short term CiK equipment;
- Specifications for core inspection equipment are currently inadequate;
- Review different options of obtaining OSI equipment, including long term CiK, donation, renting, etc.

(4) Advice on plans for the next training cycle:

- Address issues of selection of participants and how to assure confidence in their expertise;
- Consider ways to approach the optimization of parallel and sequential aspects of the training cycle to minimize the total training time needed;
- Prior to the next large scale exercise, determine the level of IT self-sufficiency;
- Consider possible support by States Signatories for a permanent training support facility;
- Coordinate training activities with other activities to take advantage of synergies;
- Consider evaluation of the next training cycle.

Acknowledgements by the Rapporteur

The Rapporteur acknowledges the Documentation Section of the OSI Division, especially Marie Tweed and Wang Jun and the workshop staff, for all of their support during the workshop and in putting this report together. Their organizational skills for compiling all the presentations, participant contact information and other annexes of this report, compiling and formatting of the report, and distributing it for review by all of the participants are exceptional and their efforts greatly facilitated the task of preparing this report. The careful work of the subject leaders in helping to focus the final discussions and formulate session summaries is also acknowledged. Finally, the co-chairpersons of this workshop and the Director of the OSI Division were instrumental in keeping the focus of this workshop and the report on the most important issues facing the OSI regime at this time.

ANNEX I

LIST OF PRESENTATIONS

Opening Session

1. Kvok, B., PTS, Opening Remarks on Behalf of the OSI Division.
2. Shchukin, V., Russian Federation, OSI Workshop-16: IFE08 Lessons Learned and Follow-Up: Objectives of the Workshop (CTBT/OSI/WS-16/PR/26).
3. Zucca, J., USA, Programme of Work.
4. Sweeney, J., USA, Guidance on Workshop Report Drafting.

Session A: Lessons Learned

1. Balczo, B., PTS, Integrated Field Exercise 2008 (CTBT/OSI/WS-16/PR/01).
2. Belyashova, N., Kazakhstan, Some Remarks by the Host Country Concerning IFE08 (CTBT/OSI/WS-16/PR/32).
3. Prah, M., PTS, PTS Preparations for EIF: OSI Must-Do List (CTBT/OSI/WS-16/PR/02).
4. Kvok, B., PTS, Overview of the OSI Division 2010 Programme and Budget (CTBT/OSI/WS-16/PR/18).
5. Lampalzer, H., PTS, OSI Workshop-16: Lessons Learned (CTBT/OSI/WS-16/PR/12).
6. Alamo, S., PTS, IFE08 Evaluation Results (CTBT/OSI/WS-16/PR/03).
7. Wang, J., PTS, Report on OSI Workshop-15 (CTBT/OSI/WS-16/PR/04).

Session B: Technical Review

1. Arndt, R., PTS, Introduction: Technical Review (CTBT/OSI/WS-16/PR/30).
2. Labak, P., PTS, SAMS Technique and Equipment: Current Status and Future Development (CTBT/OSI/WS-16/PR/05).
3. Tanaka, J., PTS, Radionuclide Equipment: Current and Future (CTBT/OSI/WS-16/PR/06).
4. Gaya-Piqué, L., PTS, CPT Techniques and Equipment: Current State and Future Requirements (CTBT/OSI/WS-16/PR/07).
5. Abushady, A., PTS, FIMS and Next Stage of Development (CTBT/OSI/WS-16/PR/13).
6. Tweed, M., PTS, OSI Documentation Management System (CTBT/OSI/WS-16/PR/08).
7. Abushady, A., PTS, Communications Capabilities: Current and Future (CTBT/OSI/WS-16/PR/14).
8. Anderson, J., PTS, OSI Logistics: Current and Future (CTBT/OSI/WS-16/PR/17).
9. Millon, J.-M., PTS, Operational Data Flow for OSI Missions (CTBT/OSI/WS-16/PR/09).

Session C: Knowledge Update

1. Zucca, J., USA, Introduction.
2. Ludwig, B., Germany, Visual Observation from Overflights (CTBT/OSI/WS-16/PR/16).
3. Henderson, J., USA, Multi-Spectral and Infrared Imaging for On-Site Inspections (CTBT/OSI/WS-16/PR/22).

4. Walker, J., UK, Overflights: UAVs as a Possibility? Legal and Technical Issues (CTBT/OSI/WS-16/PR/11).
5. Kuang, F., China, A Practical Strategy for Visual Observation (CTBT/OSI/WS-16/PR/27).
6. Bowyer, T., USA, Noble Gas Sampling for OSI (CTBT/OSI/WS-16/PR/20).
7. Zhang, Y., China, Comment on Ar-37 System (CTBT/OSI/WS-16/PR/33).
8. Sweeney, J., USA, Seismic Detection: Passive and Active (CTBT/OSI/WS-16/PR/24).
9. Dougan, A., USA, Radiation Detection Technologies for On-Site Inspection (CTBT/OSI/WS-16/PR/25).
10. Wohletz, K., USA, FIMS: Field Information Management System (CTBT/OSI/WS-16/PR/23).
11. Milbrath, B., USA, Radionuclide Sampling and Detection (CTBT/OSI/WS-16/PR/21).
12. Gong, B., China, Consideration on Further Development of Geophysical Techniques for the OSI Purpose (CTBT/OSI/WS-16/PR/29).
13. Hawkins, W., USA, Drilling to Obtain Samples (CTBT/OSI/WS-16/PR/28).
14. Abdul Hafez, W., Jordan, General View (CTBT/OSI/WS-16/PR/35).

Session D: Guidance for Action Plan

1. Shchukin, V., Russian Federation, OSI Milestones and Matrix Plan for OSI Technical Capability Build-Up (CTBT/OSI/WS-16/PR/34).
2. Li, Z., China, Some Overall Views on IFE08 and Suggestions for OSI Technology Development (CTBT/OSI/WS-16/PR/15).
3. Arndt, R., PTS, Equipment and Implementation Related Projects for 2010 and Beyond (CTBT/OSI/WS-16/PR/31).
4. Ichimasa, S., Japan, Strengthening of Capacity Building for Future OSI Readiness (CTBT/OSI/WS-16/PR/10)
5. Melamud, M., PTS, Preliminary View on the Second OSI Training Cycle: Based on IFE08 Lessons Learned (CTBT/OSI/WS-16/PR/19).
6. Sweeney, J., USA, ISS OSI Invited Meeting 24-27 March 2009 (CTBT/OSI/WS-16/PR/36).

ANNEX II

LIST OF PARTICIPANTS

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