In August 2015, technical experts representing the 183 Member States of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) congregated in Vienna, Austria, to discuss issues related to the verification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). It was the 45th meeting of what is commonly known as Working Group B (WGB). I take great pride in WGB’s achievements and am fortunate to be one of a few experts to have participated in every single meeting since the group’s inception in 1997.

The number of WGB meetings to date has further significance. Before the CTBT opened for signature in September 1996, another group which was known as the Group of Scientific Experts (GSE) met 45 times over a 20-year period to develop and test several concepts required to help verify a potential comprehensive test ban treaty. It therefore seems appropriate to look back to the beginning and to consider where we are today and what we can hope for the future.


To appreciate the evolution of our critical mission from its early days to the initiative that has now become the CTBTO, we must look back to the efforts of the GSE, established by the United Nations Conference on Disarmament held in Geneva, Switzerland. The GSE was tasked to provide through international cooperation research and development for detection, monitoring and analysis procedures needed for nuclear testing verification.

To accomplish that goal the GSE designed a process through which experimental seismic data were collected and sent to an experimental International Seismic Monitoring System with an innovative International Data Centre in Arlington, Virginia, USA. It was in that facility, which I visited often during that time, that the first software for processing global seismic and hydroacoustic monitoring data was created. Little did I know that in future years my career would be intimately linked with that software and the goals of this programme.

Those who were involved with the GSE know that their efforts provided the background for the current CTBT: the techniques involved, the data used in the analysis process, the design for the International Data Centre (IDC), the International Monitoring System (IMS), and data authentication.

**THE EARLY YEARS**

When the GSE programme moved from Geneva, transitioning into the CTBTO, the first WGB meeting was held at the Vienna International Centre in Austria in 1997; this was my introduction to a programme and a goal that would define the following years of my career. It was then that I met outstanding international scientists who had originally served the GSE and now brought an understanding and a history of the technology and
the programme to the newly formed CTBTO. There was, and still is, a special honour for them in having ‘been there from the beginning’!

The Preparatory Commission was created as an oversight group within the new CTBTO structure; I was sent by the U.S. State Department to several early meetings. Many of the members of this Commission had been involved in the GSE.

In those early days there were many behind-the-scenes tasks to be completed to prepare systems and programmes for future Treaty verification. Looking back at the WGB’s early schedule of work, the focus was on the development of the IMS and the IDC, communications, evaluation, confidence building measures, on-site inspections (OSI), authentication, and operation manuals. Many of these topics had been first introduced through earlier GSE work.

In those early meetings parallel sessions were provided; experts from the IMS and the OSI divisions met in concurrent sessions. Because of the heavy workload of these years, three WGB meetings were scheduled each year: in February, May, and August.

To illustrate some of the behind-the-scenes work necessary to create this new, unprecedented and massive worldwide project, I served on a number of committees tasked to move us to Mission Readiness, among them the IMS Development Plan under Chairman John Alwyn Davies. This 1997 committee was tasked to create an important plan of work for the next year: to build the IMS.

Ken Muirhead chaired the task on the inventory of stations to make up the IMS: We were charged with evaluating the status of stations in specific Member States. Beginning with the list of stations required by the CTBT in a specific country, we had to determine if a reported station even existed. And many times it did not. If a station did exist, did it meet IMS requirements? If it did exist, but didn’t meet IMS requirements, what would be required to bring it up to standard?

The site surveys task, also chaired by Ken Muirhead, involved determining the requirements necessary to complete a site survey in order to build a station, if no station was in place. Local conditions had to be considered; for example, some sites were located in places exposed to frigid temperatures or in extremely remote areas. I also served under Muirhead on the model agreements committee, working to ensure that the agreement a Member State signed was appropriate for that nation’s unique situation.

The authentication requirements committee, under Chairman Yves Caristan, worked toward satisfying CTBT requirements for a system to authenticate data so that the data could not be modified to appear genuine when it was not!

In the station specifications task, also under Yves Caristan, we...
evaluated the GSE specifications and then modified them to meet the requirements set for the CTBT system. Additional research and technology had been developed, meaning that the revised requirements were probably more stringent.

Under Chairman Mohsen Ghafory-Ashtiani, the IMS training programme committee planned and directed training to be held in Vienna for the many countries that had signed the CTBT but had no experience with stations, with handling and processing the developing data, or with maintenance of the stations’ equipment.

Members of the operational manuals committee, under Chairperson Victoria Oancea, worked carefully to phrase requirements for the IMS stations and instructions for their operation.

Each of those committees, and many others, contributed to the massive effort directed toward mission readiness, but only the operational manuals committee exists today; the tasks of the other committees have been completed.

The middle years saw major changes. The WGB agenda changed, now covering a broader range of topics. Parallel sessions, the third yearly meeting, and sessions related to the IDC and IMS were eliminated. Waveform and radionuclide expert group discussions were added.

Now that most of the IMS network is installed and operating, the IDC Division has recently gone to Phase 5b operations with relatively new personnel, and the OSI Division has successfully completed the Integrated Field Exercise 2014 (IFE14) in Jordan by incorporating personnel from the IMS and IDC divisions. One could not have scripted this better.

Throughout these years, good capable leadership, support staff, and delegates have served. When they have left, good, capable people have arrived, well prepared to fit the changing situations.

With preparations nearing completion for a worldwide ban on nuclear weapons testing we are still lacking the Treaty’s entry into force. However, the eight outstanding ratifications that are preventing the CTBT from becoming international law are unrelated to CTBTO personnel or operations. On the contrary, the very existence of the CTBT has been causal, in my opinion, to having almost eliminated nuclear testing around the world.

**LOOKING AHEAD**

Our ultimate goal for the later years of the CTBTO and WGB would be full ratification of the Treaty and a worldwide ban on the testing of nuclear weapons to bring greater security to our planet. Those of us who have contributed toward this great humanitarian goal should feel a special pride in our contributions toward the well-being of all mankind and of our shared home, Planet Earth.

**CURRENT STATUS**

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**BIOGRAPHICAL NOTE**

Robert Kemerait has been a senior scientist at the Air Force Technical Applications Center (AFTAC) since 2005, where he has been working since 1974. He has been supporting the CTBTO as a delegate of WGB since its first session in Vienna in 1997. Kemerait served in the U.S. Army before studying electrical engineering at the University of Florida. Prior to his job at AFTAC, Kemerait also worked at NASA’s Kennedy Space Center and taught electrical engineering at the Florida Institute of Technology in Melbourne.