

# VERIFICATION RESEARCH, TRAINING AND INFORMATION CENTRE

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## SCIENCE, TECHNOLOGY AND THE ART OF VERIFICATION

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### Introduction

First, let me thank the organisers for inviting me to participate on this panel. It is always good to be back in Vienna and it feels especially fine to be here at the CTBTO. I can see that you have had a full course, and I suspect that you are now quite looking forward to the end. I'm therefore not going to laden your tired minds with more facts and data. Rather, I intend to take one step back, and offer some reflections on the noble art of verification.

But first, let me introduce myself. My name is Andreas Persbo, I'm a Swedish national but I have spent the last eight years working for a British NGO called VERTIC. The organisation essentially deals with the implementation and verification of international agreements, of which the CTBT is one. We do assist in implementation, but we do not actually engage in actual verification. Rather, the organisation rather works as a concepts and planning division. We attempt to foresee future requirements, and we try to sketch out verification requirements based on our projections.

My background is part military, part legal. I've also studied economics and politics. Strangely, all these experiences have come to great use at VERTIC. You see, verification enterprises are often militaristic, highly-technical, legalistic, and formulated by political and economic concerns.

I mentioned that I am going to reflect on the art of verification. My choice of words is deliberate. A good verification system designer is somewhat like an artist. It's about the materials, certainly. You need to choose a good brush, and you need to have a good canvas, and a good set of high quality paints. It's also about the technique. You need to be able to apply the paint properly, apply the right pressure in your brush strokes. But above all, it's about the picture itself. It's about the painting as a whole. Does the system fit your objectives? Is it simple and easy to understand? Is it internally coherent? Does it do its job? And my favourite question: is it beautiful?

Let's apply this analogy to the CTBT, which you have now studied for some time.

The CTBT regime has the right materials. As you've learned, it incorporates several age-old techniques to monitor compliance. Seismology has been around since ancient days, and remains one of the best ways to detect a violent event such as a nuclear test explosion. It has proved its worth again and again - North Korea comes to mind. I am confident that the seismic component will continue to improve on its detection capabilities. As you know, these have already gone beyond the design expectations of the treaty's makers.

Improved technologies in radionuclide detection will also successively be introduced in the coming years. A few weeks ago, the Swedish Defence Research Agency invited VERTIC for a half-day of discussions. We also got a tour of their SAUNA system, which detects noble gases. Its capabilities are impressive, and improvements are underway, especially in respect to portability. And this is just one small aspect of the radionuclide component.

We all saw how well the radionuclide system worked during this year's nuclear crisis in Japan. Together with atmospheric modelling (and this is a research discipline that is making considerable progress year-on-year), the radionuclide monitoring component of the International Monitoring System will prove to be a very important part of the verification regime.

Infrasound monitoring used to be a near-forgotten art. It has had something of a revival in latter years. Bharath knows a lot about this, and I hope he could say a few words about it in the discussion. Its capabilities are sharp, and getting better. Hydroacoustic monitoring part is also sometimes overlooked. Again, capabilities are impressive. Sound travels faster through water, and the smallest sound can be heard at great distances. Consider how the monitoring system contributed in identifying the cause of the Kursk disaster more than ten years ago.

So the CTBT certainly applies the right materials.

The CTBTO also applies the right technique. Consider how the Global Communications Infrastructure grabs the data, and transmits it in near-real time to Vienna. How the data gets automatically recorded and analyzed by the International Data Centre. How interesting events gets flagged for review by a human analyst. State parties get instant access to this invisible flow of data. A flow that is pouring into and streaming around the building next doors as we speak. It is impressive.

The CTBTO is not content with all its achievements, however. It is constantly trying to capture the latest innovations - and their scientific conferences are by now well known, well attended, and highly respected. The organisation is improving on an already good product. And this, my friends, is what makes it unique. It is an organisation not content with the good. It seeks the best in all that it does.

So what about the picture? Well, you may remember that Steve Jobs said that his iPad was 'magical' when he introduced it a few years ago. He said that his product would change everything. And he was right. Like the iPad, the CTBT verification regime is constructed with care and with a meticulous attention to detail. Every component has its place in this highly structured universe. Together, all these technologies become one - they become whole. And I think, for one, that the best way to describe the end result is just to paraphrase Mr Jobs: it is magical.

It is a system that monitors the entire world, that compiles a huge amount of data every day, and that still is able to find that needle in the haystack, identify it, and put it to the state parties for potential action. As the Executive Secretary sometimes say, it is a truly democratic system. In the first phase, there is no secretariat writing compliance assessments or inspection reports. Data is transmitted freely, and states are free to act on it as they wish. There is no other system like it, and I doubt we will see the emergence of something better in the near to medium-term future.

Let me now turn to some broader issues.

Overall, in spite of the slow rate of advancement, in the 25 years since VERTIC's founding in the mid-1980s there has been a substantial amount of progress in the multilateral verification of arms control. To name just a few examples in addition to the CTBT, the Chemical Weapons Convention has come into force and the IAEA has developed the Additional Protocol to its standard nuclear safeguards agreements—with more than one hundred states now implementing the enhanced safeguards measures contained in the model Additional Protocol text. All of these things are fantastic achievements for sure. They've all contributed to a safer world. But, you, know, our greatest collective challenge still remains. And I thank Rebecca for pointing out the urgency and importance of the task at hand.

We are still considering ways and means to reduce numbers of nuclear weapons worldwide. There are about twenty thousand deployed and non-deployed nuclear weapons still in existence in the arsenals of nine states. The majority of these arms are still in the possession of the United States and Russia. How to continue to reduce this staggering amount will remain a matter of priority for many countries.

It is now widely accepted that at some point the - until now largely bilateral - disarmament process will become multilateral in nature. While it is *probably too early* to advocate for a multilateral process, it is *not to soon* to think about what such a regime might require. Understandably, parties involved in negotiating nuclear arms accords are for the most part keen that such agreements include suitable and robust provisions for monitoring and verification. Verification allows the parties involved to gain assurance that what has been agreed to is being implemented as agreed. In addition, verification can act as a deterrent against cheating and—ideally—as a means of building confidence and trust.

In future arms control agreements a number of possible scenarios for disarmament verification could be envisaged:

First, A process where verification involves only nuclear-weapon states;

Second, a process where both nuclear and non-nuclear weapon states participate in verification;

Third, a process where nuclear-weapon states participate in verification alone, but relay their findings to a larger pool of countries that includes nuclear weapon states;

And finally, a process where verification involves an inter-governmental organisation in a central role.

To date, there has been little work done by nuclear-weapon states to involve non-nuclear-weapon states in nuclear disarmament verification—with the notable exception of the UK-Norway Initiative, which began in 2007. This initiative was established in order to investigate the role that a non-nuclear-weapon state such as Norway could potentially play in the field of nuclear arms control verification. The initiative is and remains a ground-breaking collaborative endeavour

What the initiative has demonstrated is:

First, a way forward for managed access of non-nuclear weapon state inspectors; and

Second, the possibility of joint design, build and deployment of trusted equipment, without proliferation risks.

The initiative is meeting in London as we gather here today, sharing its experience with fourteen other countries. The sharing of information, the communication of ideas and experience, all of those are important steps forward. But the initiative, good as it is, cannot be the only thing on the centre stage. More work is urgently needed in many more areas, going further in both ambition and scope.

There is a case for a *central role of an inter-governmental body* in future arms control agreements—with respect to verifying nuclear weapons dismantlement. Perhaps the most compelling reason is that, in a future multilateral regime, an inspection team would need to be able to carry out the necessary information collection, collation and analysis. But, and this is key, it would also need to have the status and pedigree to allow their conclusions to be trusted by all relevant state parties. An international organisation can deliver this.

Thankfully, our colleagues in Vienna have foresight. One of the main strategic priorities announced at the IAEA's Safeguards Symposium last November was a need for the Agency to be ready to take on any other nuclear verification roles that it may be called upon to engage with in the future. This includes preparing the ground, however slowly, for a potential involvement in nuclear disarmament verification. I'm glad some of our friends from the IAEA are here today.

Preparation is the key. It seems clear that whoever the future inter-governmental body might be to conduct disarmament verification in a multilateral setting, there is an interim need for a set of technical protocols and systems to be developed and agreed upon by nuclear and non-nuclear weapon states alike. Not only this, but a technical capability needs to be built—in terms of a personnel resource that is educated, trained and experienced via realistic exercises; and which, crucially, needs to be made up of NNWS as well as NWS state specialists.

We have a lot of work ahead of us. And I believe that the CTBTO, with its culture of innovative thinking, with it's characteristic of pushing the envelope always, have a potential role to play in this endeavour.

Finally, I have been asked to say a few words about the progress of work on the on-site inspection manual here at the CTBTO. So let's return to the treaty. As you know, work on this manual has been ongoing for the last ten years or so. I saw that Ms. Hongmei Deng have given a talk to you about this already, so I won't repeat what's already said.

Now, it is still being drafted by Working Group B. Some say that it has become unwieldy to the point of being unusable, and has advocated the development of a simpler set of instructions for the inspectorate in particular. Personally, I agree that the manual could be significantly refined. All work can be bettered upon. And it is important, very important, that we get this manual right. And let me tell you this. The OSI division has done a great job so far in assisting state parties to formulate the manual.

You know, I participated in the first Integrated Field Exercise in Kazakhstan in 2008, and I liked what I saw. For sure, many things remain to be exercised and developed. The exercise raised many challenges and problems. That was its purpose. That's why you exercise. You're *supposed* to have horrible experiences of events of that kind. If you don't, the ambition level haven't been set high enough.

Conditions were a bit rough. The CTBTO lifted enough equipment to the steppes of Kazakhstan to fill ten containers. I seem to recall that the total weight was over thirty metric tonnes. The organisation set up a minor tent-city in the middle of nowhere in a very short space of time. It got the equipment up and running, and it got activities underway, within a matter of days. The scale of the undertaking was akin to a minor relief effort. And let me tell you, and I'm sure Rebecca will agree with me, the Semipalatinsk test site gets really cold at night. I don't think I've been that cold in my entire life, and I am very grateful to a certain friend in OSI division that lent me a very warm coat. Without it, I would surely have died.

Is the OSI regime ready to be deployed right now? Probably not. But are all the fundamental elements for a successful on-site inspection in place? Most certainly. My impression was that most elements for a successful on-site inspection were in place. There are issues still to sort out. Some serious, some less so.

But the main point is this: *on-site inspections work*. And I am personally confident that on-site inspections will be able to localise, identify and characterise an illegal nuclear test if and when they're called upon to do so. In fact, we will partly discuss these issues at an upcoming VERTIC seminar on the verification regime of the CTBT, scheduled to be held next February in New York City.

Over the past several years, VERTIC has released a series of briefing papers on the verification aspects of the CTBT, culminating with a paper by Dr John Walker on the deterrence value of the IMS. The others have been written by Jeffrey Lewis of CNS, Edward Ifft from the US State Department and Victor Slipchenko from the Russian Federation. Both technical negotiators of the treaty. The authors of each of these papers will each, we hope, be present in New York to present their views in person. All of the papers are available through the VERTIC website.

The aim of the New York meeting will be to raise awareness of the capabilities of the CTBT's verification architecture, in a country where many still use verification as a hook on which to hang their opposition to the treaty. As I know, and you all know, that is a flawed argument. And it is important for us all to refute those who claim that this treaty cannot be properly monitored, for its verifiability is *perhaps the strongest argument* in support of bringing the CTBT into force that there is.

In conclusion, let me again thank the CTBTO for inviting me to this wonderful event. Let me also thank you all for taking such an active interest in test-ban issues. And I see many familiar faces in the audience. You are all important for what's about to come.

We are in the end game, people. Only eight more ratifications are required after Indonesia's ratification earlier this week. *Eight more to go*. The road ahead is still long, but there is now an end in sight. When this treaty enters into force, nuclear test explosions will be banned *once and for all*. *Eight more ratifications*. Have no doubt: your help, your dedication, and your commitment are all necessary to achieve this goal.

Thank you for your kind attention.