Comprehensive Nuclear-Test-Ban Treaty (CTBT) and CTBT Organization

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History of Nuclear Testing

Trinity Test

- First nuclear test – Trinity Test on July 16, 1945 by the United States (‘The Gadget’)

- Part of the Manhattan Project led by J.Robert Oppenheimer (Director of Los Alamos Lab)

- Yield – about 20 kilotons of TNT (later 16 kt in Nagasaki and 21 kt in Hiroshima, same type of device)
History of Nuclear Testing
Hiroshima and Nagasaki

- August 6 and 9, 1945
- Two bombs w/ yield <20 kt each
- 'Little Boy' (gun-type) and 'Fat Man' (implosion-type)
- The only use of nuclear weapons in history
- >200, 000 victims of the bombings
History of Nuclear Testing

Further Tests

- 1949 – USSR’s first nuclear test
- 1952 – UK’s first nuclear test
- 1952 – 1959 – USSR, US and UK continue testing, growing number of tests per year
- 1959 – 1960 – Moratorium on nuclear testing
- 1960 – France’s first nuclear test
- 1961 – Peak of nuclear testing
- 1964 – China’s first nuclear test
- 1974 – India’s first nuclear test
- 1991 – USSR announces unilateral moratorium
- 1992 – US joins the moratorium (last test in 1993)
- 1998 – Pakistan’s first and last nuclear test
- 1998 – Moratorium becomes universal
- 2003 – DPRK’s first nuclear test

OVER 2000 NUCLEAR TESTS OVERALL
Early Attempts to Limit Nuclear Testing
PTBT, Outer Space Treaty, LANWFZ and NPT

1963-1977: Limits on Nuclear Testing

- 1963: Partial Test Ban Treaty
- January 1967: Outer Space Treaty
- July 1968: Nuclear Nonproliferation Treaty
- February 1967: Treaty of Tlatelolco (first NWFZ)
- Signing of the NPT

Banned nuclear explosions in all environments, apart from underground
Zone of application of Tlatelolco in Latin America and the Caribbean
Early Attempts to Limit Nuclear Testing
TTBT and PNET

- 1974 - Threshold Test Ban Treaty (TTBT) - prohibits military explosions
- 1976 - Peaceful Nuclear Explosions Treaty (PNET) – prohibits explosions for civil purposes
- Negative response to both treaties
- TTBT not ratified by the US or the USSR, PNET in force since 1990
- Banning explosions w/ the yield >150 kt didn’t make an impact
- Some even perceived it as a fake commitment to arms control by the NWS
What do we know so far?

• The first nuclear test was executed in 1945 by the US
• Over 2000 tests in the XX century and one instance of use of nuclear weapons in 1945
• The only country to test in the XX century is DPRK
• The first attempts to ban nuclear testing were made by PTBT, Outer Space Treaty, LANWFZ
• How the CTBT was negotiated and agreed upon?
CTBT: Negotiations and Opening for Signature

Negotiations

• Started in 1994 under the auspices of the Conference of Disarmament in Geneva
• Multilateral nature of talks
• Talks divided into three baskets in accordance w/ Treaty’s future verification mechanism
• Main ‘bottlenecks’ – Scope, Duration, Entry into Force

Amb. Stephen Ledogar,
Head of the US delegation

Amb. Grigory V. Berdennikov,
Head of Russian delegation

Amb. Sha Zukang,
Head of Chinese delegation
CTBT: Negotiations and Opening for Signature
Scope and Duration

In the meantime:

• France breached the de-facto moratorium (6 tests in 1995-1996)
• the US was conducting hydronuclear experiments
  • 1995 – the NPT was extended indefinitely

• SCOPE
  • The idea of a full zero-yield ban – Bill Clinton
  • Australia worked out the text of the provision on comprehensive scope

• DURATION
  • Indefinite extension of the NPT inspired the same w/ the CTBT
CTBT: Negotiations and Opening for Signature
Entry into force formula

• Initial proposals – for the Treaty’s EIF the mandatory ratification by:
  ➢ all the official NWS;
  ➢ NWS and all nuclear capable states;
  ➢ all of the CD members;
  ➢ all of the CD Members after expansion;
  ➢ all states (or 95% of those) owning nuclear reactors or developing nuclear research programs;
  ➢ a concrete number of states (e.g., 40 or 65, including NWS or including CD members);
  ➢ along the lines of the provisions of the Treaty of Tlatelolco;
  ➢ a large number of key states

• Eventually – 44 ‘nuclear technology holders’ – Annex 2 to the Treaty:
  • have nuclear reactors for research or power generation
  • have potential for such development
  • Member of CD
CTBT: Negotiations and Opening for Signature
Annex 2 States

Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Egypt, Finland, France, Germany, Hungary, India, Indonesia, Islamic Republic of Iran, Israel, Italy, Japan, Mexico, Netherlands, Norway, Pakistan, Peru, Poland, Republic of Korea, Romania, Russian Federation, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States of America, and Vietnam.
CTBT: Negotiations and Opening for Signature

• CTBT was finalized and opened for signature on September 24, 1996
• Most of the countries, including Russia, US, France, UK and China signed the Treaty on that day
• India, Pakistan and the DPRK never joined
• A de-facto non-testing norm
CTBT: Main Clauses

Article I: Basic Obligations

1. Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.

2. Each State party undertakes, furthermore, to refrain from causing, encouraging, or in any way participating in the carrying out of any nuclear test explosion or any other nuclear explosion.

The CTBT: Main Provisions

- Article II: the Organization
  - Oversees IMS and IDC
  - Executive Council:
    - 51 Members from 6 geographical regions
    - Chosen according to political and security interests, nuclear capabilities, no. of monitoring facilities, expertise and budgetary contribution
    - Also chosen according to rotation and elections

- Article XIV: Entry Into Force
  - Politically challenging
  - June 1996: Ambassador Ramaker presented revised text
  - 44 Annex 2 States: Had reactor in 1996 and were members of CD in 1996
  - Treaty will enter into force 180 days after deposit of last instrument of ratification
CTBT: Verification Mechanism

Overview

• CTBT Verification Mechanism comprises of the three pillars – International Monitoring System (IMS), International Data Center (IDC) and On-Site Inspections (OSI).

• This mechanism creates a comprehensive system of monitoring nuclear-related activity in all environments (atmosphere, water, ground/underground) through installing respective stations.

OSI simulation - Integrated Field Exercise (Jordan, 2014)
CTBT: Verification Mechanism
International Monitoring System

Each type of nuclear test has its own method of detection.
A nuclear explosion can be distinguished from any other type of seismic activity by emission of radionuclides and noble gas.
Waveform technology = type of verification/stations of the IMS.
Apart from Waveform technology there are also radionuclide stations.
CTBT: Verification Mechanism
IMS. Seismic, Hydroacoustic and Infrasound.

SEISMIC

Hydroacoustic

Infrasound

Source Discrimination I
- Strength of a signal for an underwater nuclear tests will be much stronger than most other signals and can be easily detected

Source Discrimination II

Chemical explosion  Nuclear test  Earthquake
CTBT: Verification Mechanism

IMS. Radionuclide Technology.

• Nuclear explosion mostly contains of blast, shockwave and heat. There is initial radiation + residual radiation (10%).

• Release of radioactive debris can detect an atmospheric, underwater and shallow underground explosion.

• Well-contained underground or deep underwater nuclear explosions, however, do not release any radioactive particles into the air. Another method is needed to detect them.

• Radioactive noble gas isotopes – in particular xenon isotopes - are among the fission products generated in a nuclear explosion
CTBT: Verification Mechanism
IMS. Radionuclide Technology.
CTBT: Verification Mechanism
IMS. How the radionuclide detection works

DPRK III: 12 February 2013

- 8 April 2013: Noble gas detection
- RN38 and RN58
- Xenon-131m and xenon-133
- Detection coincides with DPRK III event

• Emission of radionuclides and noble gases is the only way to ascertain the nuclear nature of an event

*simulation of the recent DPRK test
CTBT: Verification Mechanism
International Monitoring System

When complete, the IMS comprises of 337 stations

Primary:
• Seismic: 50
• Infrasound: 60
• Hydroacoustic: 11
• Radionuclide: 80

+ 120 auxiliary seismic
CTBT: Verification Mechanism
International Monitoring System

Current status: 90% ready

INTERNATIONAL MONITORING SYSTEM STATUS

- CERTIFIED STATIONS: 291
- INSTALLED: 14
- UNDER CONSTRUCTION: 6
- PLANNED: 26
CTBT: Verification Mechanism
International Data Center

- International Data Center is a tool to provide initial data analysis and present States with basic parameters describing an event such as the location, magnitude and depth.

[...] The International Data Centre [...] products shall be provided at no cost to States Parties and shall be without prejudice to final judgements with regard to the nature of any event, which shall remain the responsibility of States Parties.

CTBT, Protocol Part I para 18
CTBT: Verification Mechanism
How it works
CTBT: Verification Mechanism
On-Site Inspections

➢ An on-site inspection (OSI) is the final verification measure under the CTBT and follows up suspicious but inconclusive evidence of a nuclear explosion obtained by the global network of monitoring stations.

➢ An on-site inspection is a meticulous search of a clearly defined inspection area to gather evidence on whether or not a nuclear explosion has taken place.

• Only a State Party may request an OSI which has to be approved by the Executive Council (EC).

• Each State Party has the right to request an OSI.

• The country that is being inspected is called an Inspected State Party (ISP). The ISP has the right and the obligation to demonstrate its compliance with the Treaty.

• OSI can be conducted only after entry into force of the Treaty.
CTBT: Verification Mechanism

On-Site Inspections

- To clarify instances of non-compliance
- Likely to be used as last resort only
- A deterrent by its sheer existence

“The sole purpose of an on-site inspection shall be to clarify whether a nuclear weapon test explosion or any other nuclear explosion has been carried out in violation of Article I and, to the extent possible, to gather any facts which might assist in identifying any possible violator.” – Article IV, Paragraph 35

Main Obligations of the Requesting State Party:
- To keep the OSI request within the scope of the Treaty.
- To provide only legitimate information in the request.
- To refrain from unfounded or abusive OSI requests.

- OSI request based on information collected by IMS and through National Technical Means (NTM) in a manner consistent with international law
- NTM can include satellite imagery
- RSP may not make abusive or unfounded requests
What do we know so far?

- The CTBT Verification Mechanism consists of three main pillars – IMS, IDC and OSI.
- IMS uses four types of technology – seismic, hydroacoustic, infrasound and radionuclide.
- The IMS is 90% complete and is working efficiently to provide the needed data to detect nuclear explosive activity which was shown in case of DPRK nuclear tests.
- But who is going to assure the robust verification and compliance with the Treaty?
The CTBT Organization (CTBTO)

- CTBT Article 2.1:

[...]The States Parties hereby establish the Comprehensive Nuclear Test-Ban Treaty Organization (hereinafter referred to as "the Organization") to achieve the object and purpose of this Treaty, to ensure the implementation of its provisions, including those for international verification of compliance with it, and to provide a forum for consultation and cooperation among States Parties. [...]
The CTBT Organization (CTBTO)

Control regime
- IMS
- IDC
- OSI
- CBMs

Main principle
Conduct verification in the least intrusive manner

Member States
All signatories to the Treaty (incl. those that haven’t ratified)

Data
Provides States Parties with necessary data w/ regards to the IMS activity without any conclusions
The CTBT Organization (CTBTO)

• Founded in 1996
• HQ in the UN Office, Vienna
• Executive Secretary – Lassina Zerbo (Burkina-Faso)
• Promotes the Treaty and sustains its verification regime
• Annual contribution - US$ 37 741 400 (2017)
• Hosts main events – Article XIV Conferences, CTBT Ministerial Meetings, PTS Plenary Sessions
• Has two bodies – Group of Eminent Persons and Youth Group
The CTBT Organization (CTBTO) Preparatory Commission. Group of Eminent Persons

- Created in 2013.
- Comprises of the most distinguished disarmament and nonproliferation experts/diplomats.
- Through their expertise, experience and political standing, this Group of Eminent Persons (GEM) supports and complements efforts to promote the Treaty’s EIF as well as reinvigorating international endeavors to achieve this goal.
- Last met in Astana in September 2018
The CTBTO Youth Group was launched at the symposium on “Science and Diplomacy for Peace and Security: the CTBT@20”, held in Vienna in 2016. The group is open to all students and young graduates who are directing their careers to contribute to global peace and security and who wish to actively engage in promoting the CTBT and its verification regime.

Group Objectives:

- Revitalize the discussion around the CTBT among decision-makers, academia, students, expert society and media;
- Raise awareness of the importance of the nuclear test-ban;
- Build a basis for knowledge transfer to the younger generation;
- Involve new technologies into promoting the CTBT – social media, digital visualization, interactive means of delivering information etc.;
- Place the CTBT on the agenda of the world’s most important nuclear-related events.
CTBT: Current Situation

- The Treaty has not yet entered into force
- Ratification of 8 remaining Annex 2 States needed
- The IMS is working and fulfilling its task
- The de-facto moratorium on testing still holds (except for the DPRK)
CTBT Ratification by the U.S.

➢ 1996: the US was one of the first to sign CTBT
➢ 1999: the US Senate disapproves CTBT ratification on the following grounds:

1) Without full-scale testing confidence in the US nuclear arsenal will inevitably decline
2) The Treaty is virtually unverifiable and it is impossible to track compliance to the CTBT

HOWEVER,

1) The IMS is 90% ready and proving its efficiency in monitoring nuclear-related activity
2) Since announcing moratorium, the US started STOCKPILE STEWARDSHIP PROGRAM that is confirmed to be an efficient way to sustain the country’s nuclear arsenal

THESE CONCERNS ARE NOW GROUNDLESS
Why CTBT is important?
Current security environment

• Growing discussion on whether to resume testing (modernisation of NW)

• CTBT: last ratification - 1 in 2018
• last Annex 2 ratification - 1 in 2012

• DPRK has already conducted 6 nuclear tests in the XXI century, the last one in September 2017. Despite ‘rapprochement’ with the US, no significant progress.

‘Business as usual’ is not working, New strategy NEEDED
Status of the CTBT signature and ratification

Signed: Total: 196
Signed: 183
Last signed: 2018 (Tuvalu)

Ratified: Total: 166
Last ratification: 2018 (Thailand)

Annex 2 (44 total):
Ratified: 36
Last ratification: 2012 (Indonesia)

Signed (w/out 136 signed in 1996)  
Ratified (w/out 1 ratified in 1996)  
Annex 2 ratified
What can rekindle the CTBT discussion?

Scenario 1.
Full-scale ground nuclear test by one of the ‘nuclear haves’:

a) a chain reaction of testing
b) need for stronger regulations
=> CTBT

Scenario 2.
Ratification by one of the Annex 2 countries, in particular, the US.
Practical Steps Towards CTBT EIF

1. A closer linkage between NPT and CTBT

1.1 Use the NPT more actively as an instrument to promote CTBT

... Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end... (paragraph 11, NPT Preamble)

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Practical Steps Towards CTBT EIF

1. A closer linkage between NPT and CTBT

To set a goal - all of the non-signatory non-Annex 2 states to sign CTBT by the 2020 NPT RevCon

- Bhutan,
- Cuba,
- Dominica,
- Mauritius,
- Saudi Arabia,
- Somalia,
- South Sudan,
- Syria,
- Tonga
Practical Steps Towards CTBT EIF

2. To draw attention to CTBT

2.1 ‘One step at a time’ initiative - a sequence of smaller-scale initiatives related to CTBT:

- DPRK announces moratoria
- China signs PTBT
- India authorizes IMS stations installation
- Positive dynamic for CTBT EIF
Practical Steps Towards CTBT EIF

2. To draw attention to CTBT

2.2 Joint diplomatic démarches by P5 CTBT Member States (Russia, France, UK)

Such efforts on the margins of the 2016 NSS resulted in growing number of state signatories to the International Convention for the Suppression of Acts of Nuclear Terrorism.
Practical Steps Towards CTBT EIF

2. To draw attention to CTBT

2.3 Include CTBT in major discussion platforms’ agenda

EU Non-Proliferation Consortium
The European Network of Independent Non-Proliferation Think Tanks

- EU 2016 Consortium - no panel on CTBT

CICA

- CICA & SCO - include all of the Annex 2 States located in Asia except for the DPRK

Carnegie International Nuclear Policy Conference - CTBT included once in several years
Useful Links:

1) CTBTO Official Website: www.ctbto.org
2) CTBT Text: https://www.ctbto.org/the-treaty/treaty-text/
3) CTBT Youth Group Portal: https://youthgroup.ctbto.org
4) CENESS Website: http://ceness-russia.org/engl/

In case you have any questions – please, feel free to contact me via email: shavrova@ceness-russia.org

Thanks for your attention!