Banning the Bang or the Bomb?

The Comprehensive Test Ban Treaty (CTBT), negotiated between 1994 and 1996, is the latest development in the nuclear arms control regime. It continues to serve a vital role in preserving the privileged status of the nuclear-weapon states and barring the way to proliferation. *Banning the Bang or the Bomb?* brings together a team of leading international experts who together analyze its negotiation as a model of regime creation, examining collective dynamics, the behavior of individual countries, and the nature of specific issues. The book offers practical guidance and training for future members of the Comprehensive Nuclear Test Ban Treaty Organization inspectorate to help them negotiate during an on-site inspection (OSI) in an inspected state. This is a valuable resource for researchers and professionals alike that turns an analysis of what has happened into a manual for what is about to happen.

 MORDECHAI MELAMUD is a retiree of the Provisional Technical Secretariat of the Preparatory Commission of the CTBTO and is an associate member of the PIN group. He was formerly a research physicist with a Ph.D. in experimental physics from the Weizmann Institute of Science.

 PAUL MEERTS is a Senior Research Associate at the Netherlands Institute of International Relations, Clingendael.

 I. WILLIAM ZARTMAN is Emeritus Professor of International Organization and Conflict Resolution at the School of Advanced International Studies (SAIS), Johns Hopkins University.
Banning the Bang or the Bomb?

Negotiating the Nuclear Test Ban Regime

Edited by

Mordechai Melamud, Paul Meerts, and I. William Zartman
Contents

List of figures vii
List of maps viii
List of tables ix
List of contributors x
Processes of International Negotiation (PIN) xii
List of abbreviations xv

Introduction 1
I. WILLIAM ZARTMAN AND MORDECHAI MELEMD

Part I: Negotiation

1 Historical context and steps to implement the CTBT 17
   PIERCE S. CORDE

2 The verification debate and its effects on the negotiation process 32
   P. TERRENCE HOPMANN

3 The negotiating process, 1994–1996: a view from the chair 58
   JAAP RAMAKER

4 The importance of coupling: the Limited Test Ban negotiations 75
   FEN OSLER HAMPSO

5 The role of civil society in negotiating the CTBT 96
   REBECCA JOHNSON

6 Formulas and tradeoffs 120
   I. WILLIAM ZARTMAN AND JUlia LENDORF

7 Framing the CTBT debate over the US ratification of the treaty 146
   CHRIS MCINTOSH
vi Contents

8 The Russian position on the CTBT  
ALEXEY FENENKO  166

9 Explaining why India opted out  
ULRIKA MÖLLER  190

Part II: Verification 219

10 Nuclear Test Ban Treaty implementation  
HEIN HAAK  221

11 Enhance the legal status of the CTBTO pending the treaty entry into force  
FRANZ CEDÉ  227

12 Can a monitoring and verification system be designed by negotiation?  
NICHOLAS KYRIAKOPOULOS  233

13 Errors of the first and second kind in authorizing CTBT on-site inspections  
RUDOLF AVENHAUS AND THOMAS KRIEGER  253

14 Preparations for negotiations on the noble gas categorization scheme  
MARTIN KALINOWSKI AND SIMON HEBEL  270

15 The case of Arcania: perspectives in point-of-entry negotiations  
ARIEL MACASPAC PENETRANTE  277

16 The negotiation hurdles on the inspection trail  
MORDECHAI MELAMUD  297

17 Negotiation training for inspectors  
P. TERRENCE HOPMANN  311

18 Putting OSI on the table  
PAUL MEERTS AND MORDECHAI MELAMUD  326

19 Lessons from the CTBTO negotiation processes  
MORDECHAI MELAMUD, PAUL MEERTS, AND I. WILLIAM ZARTMAN  341

Appendix: Simulation of a CTBT on-site inspection  
PAUL MEERTS AND MORDECHAI MELAMUD  350

Index  369
Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Prisoners’ dilemma depiction of the test ban debate</td>
<td>35</td>
</tr>
<tr>
<td>4.1</td>
<td>A multiple-streams model of policymaking</td>
<td>82</td>
</tr>
<tr>
<td>6.1</td>
<td>Verification and control</td>
<td>136</td>
</tr>
<tr>
<td>6.2</td>
<td>Justice and security</td>
<td>137</td>
</tr>
<tr>
<td>12.1</td>
<td>A feedback control model for evaluating treaties requiring verification and enforcement of compliance</td>
<td>236</td>
</tr>
<tr>
<td>13.1</td>
<td>Probabilities in a double-dichotomic decision scheme</td>
<td>256</td>
</tr>
<tr>
<td>13.2</td>
<td>Payoffs as given in Figure 13.1</td>
<td>258</td>
</tr>
<tr>
<td>13.3</td>
<td>Extensive form representation of the first variant of the general game theoretical model</td>
<td>259</td>
</tr>
<tr>
<td>13.4</td>
<td>Graphical determination of $a^*$ as given by (13.7)</td>
<td>261</td>
</tr>
<tr>
<td>13.5</td>
<td>Extensive form representation of the inspector leadership game</td>
<td>263</td>
</tr>
<tr>
<td>13.6</td>
<td>Graphical representation of (13.9)</td>
<td>267</td>
</tr>
<tr>
<td>13.7</td>
<td>Normal form of the 2 × 2 bimatrix inspection game</td>
<td>269</td>
</tr>
<tr>
<td>A1</td>
<td>Aerial photograph, annotated by Sapphiria experts (attached to request for OSI)</td>
<td>357</td>
</tr>
<tr>
<td>A2</td>
<td>Drilling site (attached to request for OSI)</td>
<td>357</td>
</tr>
<tr>
<td>A3</td>
<td>Explosion (attached to request for OSI)</td>
<td>358</td>
</tr>
</tbody>
</table>
Maps

1. Political map
2. IDC epicenter and ellipse
3. Map of inspection area prepared by the Director General as attachment to the mandate
4. Unexploded ordnance area map (live fire area)
5. Special testing area map
Tables

14.1 Expected properties of different options for a noble gas categorization scheme  

14.2 Expected categorization scheme preferences of different types of member states 

15.1 The diplomatic/military/scientific/sociopolitical/legal nexus 

page 274

275

287
Contributors

Rudolf Avenhaus is Professor of Statistics and Operations Research at the University of the Federal Armed Forces, Munich.

Franz Cede is AIES Senior Advisor at the Austrian Institute for European and Security Policy (AIES) in Vienna. Between 1999 and 2003 he was Austrian Ambassador to the Russian Federation and from 2003 to 2007 he was Austrian Ambassador to the Kingdom of Belgium and to NATO.

Pierce S. Corden is a visiting scholar at the American Association for the Advancement of Science (AAAS) in Washington, DC, and has worked on nuclear testing issues since 1971. He was Director of Administration at the Provisional Technical Secretariat of the Preparatory Commission of the CTBT from 2002 to 2006.

Alexey Fenenko is a Leading Research Fellow at the Institute of International Security Studies of the Russian Academy of Sciences, Moscow.

Hein Haak is at the Department of Climate and Seismology, Royal Netherlands Meteorological Institute. He is currently the Chair of Working Group B at the CTBTO Preparatory Commission.

Fen Osler Hampson is Distinguished Fellow and Director of Global Security at the School of Advanced International Studies (SAIS), Johns Hopkins University, Washington, DC.

Simon Hebel is studying for a Ph.D. at the Center for Science and Peace Research (ZNF) at Hamburg University. He is the Coordinator of the iGSe (the independent Group of Scientific Experts).

P. Terrence Hopmann is Professor of International Relations and Director of the Conflict Management Program at the School of Advanced International Studies (SAIS), Johns Hopkins University, Washington, DC.
List of contributors

REBECCA JOHNSON is Director of the Acronym Institute for Disarmament Diplomacy, Co-Chair of the International Campaign to Abolish Nuclear Weapons (ICAN), a member of the International Panel on Fissile Materials (IPFM), and a member of the women’s advisory group for the International Action Network on Small Arms (IANSA).

MARTIN KALINOWSKI is Professor for Science and Peace Research and Director at the Carl Friedrich von Weizsäcker Centre for Science and Peace Research at the University of Hamburg.

THOMAS KRIEGER worked as a Lecturer in the Faculty of Computer Science at the University of the Federal Armed Forces, Munich, before joining the International Atomic Energy Agency in Vienna.

NICHOLAS KYRIAKOPOULOS is Professor of Engineering in the Department of Electrical and Computer Engineering at the George Washington University, Washington, DC.

JULIA LENDORFER is Social Development Specialist at the World Bank.

CHRIS MCINTOSH is Visiting Assistant Professor in Political Studies at Bard College, NY.

PAUL MEERTS is a Senior Research Associate at the Netherlands Institute of International Relations, Clingendael.

MORDECHAI MELAMUD is a retiree of the CTBTO and the IAEC, and is an associate member of the PIN group. He was formerly a research physicist with a Ph.D. in experimental physics from the Weizmann Institute of Science.

ULRIKA MÖLLER is an Assistant Professor at the Department of Political Science at the University of Gothenburg.

ARIEL MACASPA MACASPAC PENETRANTE is a researcher at the Institute for Infrastructure and Resources Management at the University of Leipzig.

JAAP RAMAKER currently serves as the special representative to promote the CTBT ratification process.

I. WILLIAM ZARTMAN is Emeritus Professor of International Organization and Conflict Resolution at the School of Advanced International Studies (SAIS), Johns Hopkins University, Washington, DC.
About the Processes of International Negotiation (PIN) Network at the Netherlands Institute for International Affairs, Clingendael

Since 1988, the PIN Program, formerly at IIASA in Laxenburg, Austria, and now located at Clingendael, The Hague, Netherlands, has been conducted by an international Steering Committee of scholars, meeting three times a year to develop and propagate new knowledge about the processes of negotiation. The Steering Committee conducts one or two workshops every year devoted to the analysis and improvement of the practice of negotiation, involving scholars from a wide spectrum of countries, in order to tap into a broad range of international expertise. It also offers mini-conferences on international negotiations in order to disseminate and encourage research on the subject. Such “Road Shows” have been held at the Argentine Council for International Relations, Buenos Aires; Beida University, Beijing; the Center for Conflict Resolution, Haifa; the Center for the Study of Contemporary Japanese Culture, Kyoto; the School of International Relations, Tehran; the Swedish Institute of International Affairs, Stockholm; the University of Cairo; University Hassan II, Casablanca; the University of Helsinki; and the UN University for Peace, San Jose, Costa Rica.

The PIN Network publishes a semiannual online newsletter, PINPoints, and sponsors a network of over 4,000 researchers and practitioners in negotiation. Past projects and the program have been supported by the William and Flora Hewlett Foundation, the Smith Richardson Foundation, the US Institute of Peace, UNESCO, the Carnegie Corporation, and the Carnegie Commission for the Prevention of Deadly Conflict.

Members of the PIN Steering Committee

Cecilia Albin, Uppsala University
Mark Anstey, Nelson Mandela University
Guy Olivier Faure, University of Paris V–Sorbonne
Processes of International Negotiation (PIN) xiii

Paul Meerts, The Netherlands Institute of International Relations, Clingendael
Mordechai Melamud, CTBTO, Vienna
Valerie Rosoux, Catholic University of Louvain
Rudolf Schüssler, Bayreuth University
Mikhail Troitskiy, MGIMO, Moscow
I. William Zartman, Johns Hopkins University

Emeritus members
Rudolf Avenhaus, German Armed Forces University, Munich
Gunnar Sjöstedt, Swedish Institute of International Affairs

PIN PUBLICATIONS


Abbreviations

ABM anti-ballistic missiles
ABM Treaty Anti-Ballistic Missile Treaty
ACDA Arms Control and Disarmament Agency
AFC Article XIV (Fourteen) Conference
BWC Biological Weapons Convention
C&C consultation and clarification
CBW chemical/biological weapons
CCD Conference of the Committee on Disarmament
CD Conference on Disarmament
CRS Congressional Research Service
CSCE Conference on Security and Cooperation in Europe
CSIS Center for Strategic and International Studies
CTB Comprehensive Nuclear Test Ban
CTBT Comprehensive Nuclear Test Ban Treaty
CTBTO CTBT Organization
CWC Chemical Weapons Convention
D3 or D4 NCS (India, Pakistan, Israel, and North Korea)
DOD Defense Department
DPRK Democratic People’s Republic of Korea
EC Executive Council
EIF entry into force
ENDC Eighteen-Nation Disarmament Conference
ES Executive Secretary
FMCT Fissile Material Cutoff Treaty
G7 Group consisting of the finance ministers of seven industrialized nations: the US, the UK, France, Germany, Italy, Canada, and Japan
G8 A forum for the governments of eight of the world’s largest national economies: the G7 states plus Russia
G21 Group of twenty-one developing nations
G77 Group of seventy-seven developing nations
List of abbreviations

GATT  General Agreement on Tariffs and Trade
GPS  global positioning system
GSE  Group of Scientific Experts
HNE  hydronuclear experiments
IAEA  International Atomic Energy Agency
IDC  International Data Center
IFEO8  Integrated Field Exercise 2008
IIGSA  International Institute of Applied Systems Analysis
IMS  International Monitoring System
IMTR  Interstellar Military Test Range
INF  intermediate-range nuclear forces
INGE  International Noble Gas Experiment
IPPNW  International Physicians for the Prevention of Nuclear War
JASON  An independent group of scientists which advises the US government on matters of science and technology, named after the mythical Jason, leader of the Argonauts
KPRF  Kommunisticheskaya Partiya Rossiskoy Federatsii (Communist Party of the Russian Federation)
LDPR  Liberal Democratic Party of Russia
LTBT  Limited Test Ban Treaty
MIRV  multiple independently targetable reentry vehicle
NAM  Non-Aligned Movement
NAS  National Academy of Science
NATO  North Atlantic Treaty Organization
NCS  nuclear-capable states (see NCWS)
NCWS  nuclear-capable weapon states (India, Pakistan, Israel, and North Korea)
NDC  National Data Center
NGO  non-governmental organization
NNWS  non-nuclear-weapon states
NPT  Non-Proliferation Treaty
NRDC  Natural Resources Defense Council
NWS  nuclear-weapon states
OM  operational manual
OPCW  Organization for the Prohibition of Chemical Weapons
OSC  Operations Support Center
OSCE  Organization on Security and Cooperation in Europe
OSI  on-site inspection
PS  The five NWS according to the NPT (US, UK, Russia, China, and France)
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN</td>
<td>Processes of International Negotiation</td>
</tr>
<tr>
<td>PMO</td>
<td>policymaking organs</td>
</tr>
<tr>
<td>PNE</td>
<td>peaceful nuclear explosions</td>
</tr>
<tr>
<td>PNET</td>
<td>Peaceful Nuclear Explosions Treaty</td>
</tr>
<tr>
<td>PrepCom</td>
<td>Preparatory Commission</td>
</tr>
<tr>
<td>PSI</td>
<td>Proliferation Security Initiative</td>
</tr>
<tr>
<td>PTBT</td>
<td>Partial Test Ban Treaty</td>
</tr>
<tr>
<td>PTS</td>
<td>Provisional Technical Secretariat</td>
</tr>
<tr>
<td>RAMOS</td>
<td>Russian–American Observation Satellites</td>
</tr>
<tr>
<td>SALT</td>
<td>Strategic Arms Limitation Treaty</td>
</tr>
<tr>
<td>SORT</td>
<td>Strategic Offensive Reductions Treaty</td>
</tr>
<tr>
<td>SSP</td>
<td>Stockpile Stewardship Program</td>
</tr>
<tr>
<td>STA</td>
<td>special testing area</td>
</tr>
<tr>
<td>START</td>
<td>Strategic Arms Reductions Treaties</td>
</tr>
<tr>
<td>TNCD</td>
<td>Ten-Nation Committee on Disarmament</td>
</tr>
<tr>
<td>TS</td>
<td>Technical Secretariat</td>
</tr>
<tr>
<td>TTBT</td>
<td>Threshold Test Ban Treaty</td>
</tr>
<tr>
<td>TTE</td>
<td>table-top exercise</td>
</tr>
<tr>
<td>UNE</td>
<td>underground nuclear explosion</td>
</tr>
<tr>
<td>UNGA</td>
<td>United Nations General Assembly</td>
</tr>
<tr>
<td>UNMOVIC</td>
<td>United Nations Monitoring, Verification, and Inspection Commission</td>
</tr>
<tr>
<td>UNSC</td>
<td>United Nations Security Council</td>
</tr>
<tr>
<td>UNSCOM</td>
<td>United Nations Special Commission</td>
</tr>
<tr>
<td>VCLT</td>
<td>Vienna Convention on the Law of Treaties</td>
</tr>
<tr>
<td>VIC</td>
<td>Vienna International Center</td>
</tr>
<tr>
<td>WGB</td>
<td>Working Group B</td>
</tr>
<tr>
<td>WMD</td>
<td>weapons of mass destruction</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organization</td>
</tr>
<tr>
<td>ZOPA</td>
<td>zone of possible agreement</td>
</tr>
</tbody>
</table>