

INTERNATIONAL CBRNE MASTER COURSES SERIES

COLLANA DI SICUREZZA CHIMICA, BIOLOGICA, RADIOLOGICA E NUCLEARE

## *Director of Scientific Board*

Carlo BELLECCI

Full Professor (RtD) – President of the Scientific Board of the International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata – President of the Scientific Board of CBRNe Book series

## *Scientific Board*

Leonardo PALOMBI

Full Professor – Director of International Master Courses in Protection Against CBRNe events and Director of Department of Biomedicine and Prevention, Faculty of Medicine and Surgery, University of Rome Tor Vergata

Pasquale GAUDIO

Senior Researcher – Coordinator of International Master Courses in Protection Against CBRNe events and of Quantum Electronics and Plasma Physics Research Group, Department of Industrial Engineering, University of Rome Tor Vergata

Tiziano LABRIOLA

Prime Minister's Office – Coordinator Training and Education Department

Francesco CAMPOPIANO

Prime Minister's Office – Civil Protection Department

Vittorio FRANCESCO CUSMAI

Ministry of Defense – SMD I Reparto

Vincenzo ROSSI

Ministry of Interior

Franco SALERNO

Ministry of Defense – NBC School of Rieti

Vincenzo TROMBADORE

Ministry of Interior – Department of Public Safety

Emanuele FARRUGGIA

V Department – General Direction for Politics Affaires and Security, Foreign Office

Luciano CADONI

Ministry of Interior – Department of National Fire Fighters

Roberta FANTONI

ENEA–Italian National Agency for New Technology, Energy and Sustainable Economic Development

Sandro SANDRI

ENEA–Italian National Agency for New Technology, Energy and Sustainable Economic Development

Massimo CHIAPPINI

INGV–National Institute for Geophysics and Volcanology

Giovanni REZZA

National Health Institute

Antonio GUCCIARDINO

Responsible for the relationships with the Italian private entities of the International Master Courses in Protection Against CBRNe events

Andrea GLORIA

NATO School

Marco GAMBINI

Director of Department of Industrial Engineering, University of Rome Tor Vergata

Orazio SCHILLACI

Full Professor – University of Rome Tor Vergata

Radonav KARKALIC

Associate Professor – CBRN Department, Military Academy, University of Defence  
Republic of Serbia

Giacinto OTTAVIANI

Rear Admiral – Italian Naval Academy

Sandro MANCINELLI

Associate Professor– Didactic Management Unit of International Master Courses in  
Protection Against CBRNe events, University of Rome Tor Vergata

Francesco D'ERRICO

Associate Professor–University of Pisa

## *Director of Editorial Board*

**Andrea MALIZIA**

Senior Researcher – Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata – President of the Scientific Board of CBRNe Book series

## *Editorial Board*

Francesco UNALI

Professional Journalist – Didactic Board of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Lugi SALUCCI

Professional Journalist – Didactic Board of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Francesco GILARDI

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Dieter ROTHBACHER

Co-owner of Hotzone Solutions Group – Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Fabrizio D'AMICO

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Paolo Maurizio SOAVE

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Daniele DI GIOVANNI

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Mariachiara CARESTIA

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Orlando CENCIARELLI

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Alessandro SASSOLINI

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Francesco GILARDI

Senior Researcher – Department of Biomedicine and Prevention, Faculty of Medicine University of Rome Tor Vergata

Colomba RUSSO

Department of Industrial Engineering, University of Rome Tor Vergata

Alba IANNOTTI

Didactic Management Unit of International Master Courses in Protection Against CBRNe events, University of Rome Tor Vergata

Valentina GABBARINI  
International Master Courses in Protection Against CBRNe events, University of  
Rome Tor Vergata

Luigi Antonio POGGI  
University of Rome Tor Vergata

Jean-François CIPARISSE  
University of Rome Tor Vergata

Ahmed Gamal IBRAHIM  
University of Rome Tor Vergata

Gian Marco LUDOVICI  
University of Rome Tor Vergata

Laura MORCIANO  
University of Rome Tor Vergata



# INTERNATIONAL CBRNE MASTER COURSES SERIES

COLLANA DI SICUREZZA CHIMICA, BIOLOGICA, RADIOLOGICA E NUCLEARE



Peace cannot be kept by force; it can only be achieved by understanding.

Albert EINSTEIN

The CBRNe Book Series was born as an initiative of the Directive Board and of the Scientific Committee of “International Master Courses in Protection Against CBRNe events” ([www.mastercbrn.com](http://www.mastercbrn.com)) at the University of Rome Tor Vergata. The evolution and increase in Security and Safety threats at an international level place remarkable focus on the improvement of the emergency systems to deal with crisis, including those connected to ordinary and non-conventional events (Chemical, Biological, Radiological, Nuclear, and explosives). In every industrial Country there are multiple entities with specialized teams in very specific fields, but the complexity of the events requires professionals that not only have specific know-how, but also expertise in the entire relevant areas. Given the global interest in these issues, the Department of Industrial Engineering and the Faculty of Medicine and Surgery of the Tor Vergata University organize the international Master Courses in “Protection against CBRNe events”: I Level Master Course in “Protection against CBRNe events” (120 ECTS) and II Level Master Course in “Protection against CBRNe events” (60 ECTS). These courses aim at providing attendees with comprehensive competences in the field of CBRNe Safety and Security, through teaching and training specifically focused on real needs. Both Master Courses are designed according to the spirit of the Bologna Process for Higher Education, the Italian law and educational system. The Master Courses are organized also in cooperation with the following Italian Public Entities:

- Presidenza del Consiglio dei Ministri (Prime Minister’s Office);
- Ministero della Difesa (Ministry of Defence);
- Ministero dell’Interno (Ministry of The Interior);
- Istituto Superiore di Sanità (National Health Institute);
- Istituto Nazionale di Geofisica e Vulcanologia (National Institute for Geophysics and Vulcanology);
- ENEA (Italian National Agency for New Technology, Energy and Sustainable Economic Development);

- University Consortia CRATI, MARIS and SCIRE;
- Comitato Parlamentare per l’Innovazione Tecnologica (Parliamentary Committee for Technological Innovation).

And together with the following International Entities:

- OPCW (Organization for the Prohibition of Chemical Weapons)
- NATO Joint Centre Of Excellence (Czech Republic);
- NATO SCHOOL of Oberammergau (Germany);
- HotZone Solutions Group (The Netherlands);
- VVU-026 Sternberk (Czech Republic);
- Seibersdorf Laboratories GmbH (Austria);
- Chernobyl Centre (Ukraine).

All the above-mentioned organizations have signed official cooperation agreements with the University of Rome Tor Vergata in the aim of Master course activities. The Master have also cooperation with OSCE, IAEA, ECDC, KEMEA in the aim of the didactical activities and we are working to formalize this collaboration with a formal cooperation agreement.

Both Master Courses have been officially granted the “NATO selected” status and have been included in the NATO Education and Training Opportunities Catalogue (ETOC) and also they are supported by OPCW.

The purpose of the CBRNe book series is to give a new perspective of the safety and security risks from both a civil and military point of view, touching all the aspects of the risks from the technological to the medical ones, talking about agents and effects, protection, decontamination, training, emergency management, didactic, investigation, communication and policy.

The authors will be experts of the sector coming from civil, military, academic/research and private realities. A special thanks for the realization of this series goes to Prof. Carlo Bellecci for his initial encouragement, continuous support and help.

Nel mese di Agosto 2016 il Ministero dell’Istruzione, dell’Università e della Ricerca (MIUR) ha inserito la collana nella lista di quelle ufficialmente riconosciute con i seguenti riferimenti:

- codice di classificazione: E237557;
- titolo: CBRNE BOOK SERIES.

During the month of August, 2016, the Italian Minister for Instruction, University and Research (MIUR) has officially added this book series in the list of the official publications recognized by the Minister itself with the following references:

- classification code: E237557;
- title: CBRNE BOOK SERIES.



Michael I Thornton  
Alba Iannotti

**The table top exercise as a tool to train key  
stakeholders involved in emergencies**

Definitions, case studies and example exercises  
(Emergency simulation Part 1)





Aracne editrice

[www.aracneeditrice.it](http://www.aracneeditrice.it)  
[info@aracneeditrice.it](mailto:info@aracneeditrice.it)

Copyright © MMXIX  
Gioacchino Onorati editore S.r.l. — unipersonale

[www.gioacchinoonoratieditore.it](http://www.gioacchinoonoratieditore.it)  
[info@gioacchinoonoratieditore.it](mailto:info@gioacchinoonoratieditore.it)

via Vittorio Veneto, 20  
00020 Canterano (RM)  
(06) 4551463

ISBN 978-88-255-2899-2

*No part of this book may be reproduced  
by print, photoprint, microfilm, microfiche, or any other means,  
without publisher's authorization.*

*1st edition:*

1<sup>st</sup> edition: November 2019

# Contents

## 13 Introduction

## 15 Glossary

## 17 Chapter I

### *CBRN incidents*

1.1 Definitions of CBRN emergencies, 17 – 1.2 CBRN emergencies in history: case studies and lesson learnt, 17 – 1.2.1. *Chemical incidents*, 17 – 1.2.1.1. *Seveso, Italy – Chemical accident*, 18 – 1.2.1.2. *Bhopal, India – Chemical accident*, 18 – 1.2.1.3. *Tokyo, Japan – Intentional Chemical attack*, 19 – 1.2.1.4. *Salisbury, United Kingdom – Intentional Chemical attack*, 20 – 1.2.2. *Biological incidents*, 21 – 1.2.2.1. *Dalles, United States – Intentional bio hazard attack*, 21 – 1.2.2.2. *Ebola Dec 2013–Jan 2016 – Natural bio hazard outbreak*, 22 – 1.2.2.3. *Washington DC and New York City, United States – Intentional bio hazard attack*, 22 – 1.2.3. *Radiological and Nuclear Incidents*, 24 – 1.2.3.1. *Fukushima, Japan – Natural event causing radiological and nuclear incident*, 24 – 1.2.3.2. *Chernobyl, Ukraine – Accidental radiological and nuclear incident*, 25

## 29 Chapter II

### *Table Top Exercises (ttxs)*

2.1 Differences between a drill, table top, functional and full-scale exercise, 29 – 2.1.1. *Drill*, 29 – 2.1.2. *Table Top Exercise*, 29 – 2.1.3. *Functional*, 30 – 2.1.4. *Full Scale Exercise*, 30 – 2.2 Why use a TTX?, 32 – 2.3 Principal TTX components, 35 – 2.3.1. *The scenario*, 35 – 2.3.1.1. *Scene setter*, 35 – 2.3.1.3. *Icons and or models*, 36 – 2.3.1.4. *Injects*, 37 – 2.3.1.5. *Tasks*, 38 – 2.3.1.6. *RFI*, 38 – 2.4 Table top exercise participants, 38 – 2.4.1. *TTX organisers*, 39 – 2.4.2. *Facilitator*, 39 – 2.4.3. *Umpire*, 39 – 2.4.4. *Evaluator*, 39 – 2.4.5. *TTX team players*, 40 – 2.4.6. *Team leader*, 40 – 2.4.7. *Rapporteur*, 40 – 2.4.8. *Information manager*, 40 – 2.5 TTX rules, 41

43 Chapter III

*Examples of TTXs*

3.1 Chemshield 2011, 43 – 3.2 NATO CBRN Medical Working Group TTX on International Health Regulations 2005, 44 – 3.3 The Inter-Arab Nuclear Detection and Response Exercise Falcon 2016, 45

47 Chapter IV

*Table Top Exercises for Different Key Actors*

4.1 Key actors during CBRN emergencies, 47 – 4.1.1. *Incident commander*, 47 – 4.1.2. *CBRN advisors for decision makers*, 48 – 4.1.3. *First responder*, 48 – 4.1.4. *Emergency Services*, 48 – 4.1.5. *Police Chief*, 49 – 4.1.6. *Fire Brigade Chief*, 49 – 4.1.7. *Ambulance Service Chief*, 49 – 4.1.8. *Hazmat Team Chief*, 49 – 4.1.9. *Health Department Representative*, 50 – 4.1.10. *Public Information Officer*, 50 – 4.2 How to design customized TTXs to train different key actors, 50 – 4.2.1. *Exercise planning*, 50 – 4.2.2. *Scenario design*, 51 – 4.2.3. *Final exercise preparation*, 52 – 4.2.4. *TTX exercise delivery*, 52 – 4.2.5. *Hot wash*, 52 – 4.2.6. *Post exercise*, 54

55 Chapter V

*Case Studies: Different Scenarios*

5.1 Chemical TTX for First Responders, 55 – 5.2 Chemical TTX for advisors to the decision makers, 58 – 5.3 Biological TTX for advisors to the decision makers, 62 – 5.4 Radiological/Nuclear TTX for advisors to the decision makers, 68 – 5.5 Explosive TTX for first responders, 69

73 *Conclusions and Future Developments*

77 *References*

81 *Acknowledgments*

# Introduction

Chemical, Biological and Nuclear Weapons of Mass Destruction are normally found only within the military domain. However, in today's world, Chemical, Biological, Radiological, Nuclear and high yield explosive materials, materials have now entered the public domain. From the use of the chemical weapon Sarin against the Japanese population, to a cloud of radioactivity drifting across Europe following the disaster in Chernobyl, to the outbreak of Ebola that touched people in ten countries and the use of improvised explosive devices by terrorist groups, we are exposed to CBRNe materials intentionally, accidentally and through the whim of nature. To prepare for the effects of these agents upon our population, new skills are needed and new techniques need to be learnt and practiced. One tool that is being exploited more and more is the table top exercise or TTX. The TTX is a versatile item of the toolbox that is relatively cheap to design and deliver and can be used to develop awareness, validate plans, policies, and procedures to prevent, protect, response and recover from CBRNe incidents.

The authors, founders of INAC the International Alliance CBRN, in this work deconstruct the table top exercise, highlighting its versatility and usefulness. Through case studies of real exercises, the value of TTXs to assist in building capability and identifying potential issues with capacity are demonstrated.



## Glossary

- CBRNe: Chemical, Biological, Radiological, Nuclear and explosives
- CEPOL: The European Union Agency for Law Enforcement Training
- EUROPOL: European Union Agency for Law Enforcement Cooperation
- HESAR: Health Environment Safety Association Rome
- HIV: Human Immunodeficiency Virus
- IAEA: International Atomic Energy Agency
- INAC: International Alliance CBRN
- Injects: An inject describes an additional event or circumstance that requires a response or action from the participant
- INTERPOL: International Criminal Police Organization
- MEL: Master Events List
- NATO: North Atlantic Treaty Organization
- NHS: National Health Service (UK)
- Nuclear material: Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233
- OPCW: Organisation for the Prohibition of Chemical Weapons
- Orphan source: a self-contained radioactive source that is no longer under proper regulatory control
- PPE: Personal Protective Equipment
- Radiological material: Any material that spontaneously emits ionizing radiation
- RDD: Radiological Dispersal Device
- RFI: Request For Information

Scenario: Outline or framework of the TTX, postulated sequence or development of events

Scene Setter: Description of the situation at the location prior to the TTX incident

TOPOFF: Top Officials

TTX: Table Top Exercise

UNICRI: United Nations Interregional Crime and Justice Research Institute

WHO: World Health Organization

WMD: Weapon of Mass Destruction