

# CONTENTS

1.	INTRODUCTION .....	1
1.1.	Background .....	1
1.2.	Objective .....	1
1.3.	Scope .....	1
1.4.	Structure .....	2
2.	THE THREATS .....	3
2.1.	Assessing the threat of criminal or unauthorized acts .....	3
2.2.	Potential nuclear and radiological threats .....	5
2.2.1.	Radiological dispersal devices .....	5
2.2.2.	Nuclear explosive devices and material for such devices .....	6
2.3.	Physical and operational aspects .....	6
2.3.1.	Type of material considered .....	6
2.3.2.	Quantity of material considered .....	7
2.3.3.	Cross-border movement .....	7
2.3.4.	Criminal or unauthorized acts within national borders .....	8
2.3.5.	Loss of control .....	8
2.3.6.	Illicit trafficking under false pretences .....	9
3.	INTERNATIONAL LEGAL INSTRUMENTS .....	9
3.1.	International legal framework .....	10
3.2.	International instruments relevant to criminal or unauthorized acts .....	11
3.2.1.	Treaty on the Non-Proliferation of Nuclear Weapons .....	12
3.2.2.	NPT Exporters Committee: Zangger Committee Guidelines .....	13
3.2.3.	Nuclear Suppliers Group Guidelines .....	14
3.2.4.	Regional nuclear non-proliferation and arms control treaties .....	15
3.2.5.	IAEA safeguards agreements .....	16
3.2.5.1.	Safeguards agreements .....	17
3.2.5.2.	Additional protocol .....	18
3.2.6.	Convention on the Physical Protection of Nuclear Material .....	19
3.2.7.	Amendment to the CPPNM .....	21

3.2.8.	Convention on Early Notification of a Nuclear Accident .....	22
3.2.9.	Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency .....	24
3.2.10.	Europol Convention .....	26
3.2.11.	International Convention for the Suppression of Acts of Nuclear Terrorism .....	27
3.2.12.	Code of Conduct on the Safety and Security of Radioactive Sources .....	28
3.2.13.	Guidance on the import and export of radioactive sources .....	30
3.2.14.	United Nations Security Council resolutions .....	31
4.	INTERNATIONAL INITIATIVES .....	33
4.1.	Initiatives of the IAEA .....	33
4.1.1.	IAEA assessment of illicit trafficking in 1997 .....	34
4.1.2.	IAEA response to the events of 11 September 2001 ..	37
4.1.3.	IAEA 2002–2005 Plan of Activities to Protect against Nuclear Terrorism .....	37
4.1.4.	IAEA Nuclear Security Plan (NSP) for 2006–2009 ...	37
4.1.5.	ITDB .....	38
4.2.	Initiatives of the WCO .....	39
4.3.	Initiatives of Interpol .....	43
4.4.	Initiatives of Europol .....	45
4.5.	Initiatives of the Universal Postal Union.....	47
5.	UNDERSTANDING RADIATION AND ITS EFFECTS .....	48
5.1.	Structure of matter .....	48
5.2.	Radioactivity and radiation.....	50
5.3.	Types of radiation.....	51
5.3.1.	Alpha particles .....	52
5.3.2.	Beta particles .....	52
5.3.3.	Gamma rays .....	52
5.3.4.	X rays .....	52
5.3.5.	Neutrons .....	53
5.4.	Radiation and matter .....	53
5.5.	Nuclear fission and nuclear fusion .....	54
5.6.	Biological consequences of exposure to ionizing radiation ...	55
5.6.1.	Dose quantities .....	55

5.6.2.	Health effects .....	56
5.7.	Levels of exposure .....	56
6.	RADIATION SAFETY .....	58
6.1.	International arrangements .....	58
6.2.	General principles .....	59
6.3.	Limitation of doses .....	60
6.4.	Protection against external exposure .....	60
6.5.	Protection against internal exposure .....	61
7.	AUTHORIZED USES AND NUCLEAR COMMERCE .....	61
7.1.	General considerations .....	61
7.2.	General applications .....	62
7.2.1.	Nuclear fuel cycle .....	62
7.2.2.	Industrial uses .....	63
7.2.3.	Medical and biological uses .....	64
7.2.4.	Scientific uses .....	65
7.3.	Specific radionuclides .....	66
7.4.	Categorization of radioactive sources .....	68
7.5.	Radioactive source containers .....	69
7.6.	Authorization process .....	69
7.7.	Import and export controls .....	72
8.	TRANSPORT OF NUCLEAR AND OTHER RADIOACTIVE MATERIAL .....	73
8.1.	General considerations .....	74
8.2.	IAEA transport regulations .....	74
8.3.	Transport index .....	75
8.4.	Packages .....	76
8.5.	Excepted packages .....	76
8.6.	Industrial packages .....	77
8.7.	Type A packages .....	77
8.8.	Types B(U) and B(M) packages .....	77
8.9.	Packages containing fissile material .....	78
8.10.	Shipping documents .....	78
8.11.	Labelling .....	79
8.12.	Markings .....	79
8.13.	Placards .....	82

9.	PREVENTING CRIMINAL OR UNAUTHORIZED ACTS . . . .	83
9.1.	General considerations . . . . .	83
9.2.	Monitoring compliance . . . . .	85
9.2.1.	Control measures . . . . .	85
9.2.2.	Detection equipment . . . . .	86
9.2.3.	Training . . . . .	86
9.2.4.	Raising public awareness . . . . .	86
9.2.5.	Cooperative measures . . . . .	86
9.3.	Basic elements of crime prevention . . . . .	88
9.4.	Removing or denying opportunity . . . . .	89
9.5.	Incentives and motives . . . . .	91
9.6.	Increasing the likelihood of apprehending perpetrators . . . . .	92
9.6.1.	Sharing information . . . . .	92
9.6.2.	Increasing detection capability . . . . .	93
9.6.3.	Nuclear and classical forensics . . . . .	93
9.7.	Penalties . . . . .	95
10.	TECHNICAL DETECTION METHODS . . . . .	95
10.1.	Radiation detection equipment . . . . .	96
10.2.	Description and specification of radiation detection equipment . . . . .	98
10.3.	Fixed radiation portal monitors . . . . .	98
10.3.1.	General description . . . . .	98
10.3.2.	Installation and operation, calibration and testing . . . . .	99
10.3.2.1.	Pedestrian monitors . . . . .	100
10.3.2.2.	Vehicle monitors . . . . .	101
10.3.3.	Verification of alarms from RPMs . . . . .	101
10.3.3.1.	Pedestrian monitors . . . . .	102
10.3.3.2.	Vehicle monitors . . . . .	102
10.4.	Personal radiation detectors . . . . .	103
10.4.1.	General description . . . . .	103
10.4.2.	Operation . . . . .	104
10.4.3.	Verification of alarms from PRDs . . . . .	105
10.4.4.	Testing and calibration . . . . .	105
10.5.	Hand-held gamma/neutron search detectors . . . . .	105
10.5.1.	General description . . . . .	105
10.5.2.	Operation . . . . .	106
10.6.	Hand-held radionuclide identification devices . . . . .	106
10.7.	Radionuclide identification . . . . .	108

10.8. Detection strategy for deployment of border monitoring equipment .....	109
11. RESPONSE MEASURES .....	110
11.1. Response process and screening .....	110
11.2. Response requirements .....	112
11.3. Scale of response .....	112
11.4. Alarm verification .....	113
11.4.1. False alarms .....	113
11.4.2. Innocent alarms .....	113
11.4.3. Confirmed non-innocent alarms .....	115
11.5. Safety considerations .....	115
11.6. Expert advice .....	116
11.7. Mobile expert support team .....	116
11.8. International assistance .....	118
11.9. Routine response .....	118
11.10. Emergency response .....	120
11.11. Classical and nuclear forensics .....	121
11.12. Transport and storage of radioactive material .....	122
11.13. Control of potentially contaminated suspects .....	123
11.14. Initial legal evaluation .....	123
11.15. Prosecution of offenders .....	124
11.16. Tracing seized material .....	124
11.17. Media liaison .....	125
APPENDIX I: STATISTICS ON ILLICIT TRAFFICKING INCIDENTS AND SELECTED CASES .....	126
APPENDIX II: EXAMPLES OF RADIOLOGICAL SEARCH TECHNIQUES .....	136
REFERENCES .....	140