

A

Introduction to the Book

This book examines the legality of the threat or use of nuclear weapons from a variety of legal perspectives and from a viewpoint grounded in the 2020s. Some things should be stated from the outset. Nuclear weapons are the most awful kinds of weapon known to humankind. Their use would put at risk humanity's very existence and must, in most if not all circumstances, be seen as not only unlawful but also morally repugnant. The expression 'most if not all circumstances' is used advisedly. In an Advisory Opinion given in 1995, the International Court of Justice (ICJ) could not conclude that such use would be unlawful in all circumstances. Moreover, a number of States are known to possess them, including the five States that are permanent members of the UN Security Council. Furthermore, certain other States are believed to possess them or to have active nuclear weapon development programmes. In such circumstances, to talk of a customary rule prohibiting the possession and use in any circumstance of nuclear weapons would seem to be at variance with perceptible reality. Nevertheless, it is clear that the use of such a weapon in all but the most exceptional and serious of circumstances will generally be regarded as an unlawful act of the utmost gravity. The emotive sentiments that any use of such a weapon would be bound to unleash have no place in a strictly legal analysis. Hence, in the following Sections of this book, the complex legal issues associated with nuclear weapons are explored in as objective and clinical a manner as possible.

Section C's discussion of the rules of *jus ad bellum* as they would seem to apply to nuclear weapons use should not, however, be misunderstood as implying that the use of such a weapon would likely be considered by the international community in the same light as a use of force or armed attack involving conventional weapons. A nuclear use of force or armed attack would undoubtedly be seen for what it almost certainly would be – namely, an outrage, probably attracting global action against the perpetrator, including

forceful action, in response. Similarly, the articulation of the principles and rules of *jus in bello* and an explanation of how they would likely apply in the nuclear context should not be misinterpreted as in any way suggesting that the employment of a nuclear weapon can sensibly be equated with the conduct of conventional hostilities. It cannot. To resort to using a nuclear weapon will, in virtually all circumstances, be regarded as a most serious breach of international law, and the precautionary nuclear command, control and communications (NC3) measures discussed in Section L must be rigorous, robust and secure enough to ensure that such use will not occur outside the most exceptional, compelling and strictly lawful of circumstances. This is one area in which the global community will never forgive a mistake. NC3 measures must be designed with that ultimate truth in mind. In the opinion of the present authors, a globally recognised taboo is developing that prohibits any resort to nuclear weapon use. That taboo must be reinforced and respected, and nothing in this book is intended in any way to undermine it. Rather, the principles and rules set out below seek to articulate the additional legal constraints that apply to any use of nuclear weapons.

It is unclear, at the time of writing, how nuclear weapons may be expected to develop in the future. The possibility is that limited-yield nuclear weapons that have comparatively restricted areas of effect may emerge. How restricted those areas might become is unclear. It is therefore appropriate in the following pages to consider not just the rules that apply to strategic-level bombardment but also those that apply in the case of tactical-level engagements. Moreover, this book tackles the law as it applies in several distinct contexts.

For example, it addresses the law as it applies when a nuclear weapon is used, or when a threat of such use is made, before an armed conflict occurs. The book also addresses the law applicable to the use, or threatened use, of such a weapon during an armed conflict. Thirdly, the book considers the law that governs the use of conventional force to target a nuclear weapon, nuclear-propelled platform or nuclear installation. All of these, and other, situations are considered to come within the scope of nuclear operations, and thus to be regulated by the legal rules discussed in this book.

A.1 THE EMERGENCE OF LAW RELATING TO NUCLEAR WEAPONS

The modern law that applies to the conduct of hostilities really started to emerge in the middle of the nineteenth century. The immediately following paragraphs are not intended to provide a comprehensive history of the adoption of each legal provision that is relevant to the subject of this book. Rather,

in this short overview an attempt will be made to pick out a few of the key legal developments that help to explain, in broad terms, how the body of law that we have today came into being. Accordingly, only what are thought to be the most significant of these developments will receive a brief mention. In 1861, Dr Francis Lieber of Columbia University wrote a lengthy and authoritative statement of the laws of land warfare as they then existed – a text that was issued to the army of the Union side in the American Civil War. Among the many observations made by Dr Lieber were an acknowledgement of the necessity of those measures that are indispensable for securing the ends of the war and lawful according to the modern law and usages of war, and an appreciation that there are limits to what military necessity should permit. Specifically, he opined that it should not permit of cruelty, such as the infliction of suffering for the sake of suffering or for revenge, nor the use of poison.¹

In 1868, a Declaration was agreed among States in St Petersburg, the operative provisions of which do not need to trouble us. In the preamble to the Declaration, however, the participating States recognised the following:

That the only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy;

That for this purpose it is sufficient to disable the greatest possible number of men;

That this object would be exceeded by the employment of arms which uselessly aggravate the sufferings of disabled men, or render their death inevitable;

That the employment of such arms would, therefore, be contrary to the laws of humanity²

The modern formulation of that principle prohibits the employment of weapons, projectiles and material and methods of warfare of such a nature as to cause superfluous injury or unnecessary suffering. This principle applies to nuclear weapons in the manner explained in Section G.

After drawing attention to the military necessity principle, the Lieber Code noted ‘the distinction between the private individual belonging to a hostile country and the hostile country itself, with its men in arms. The principle has been more and more acknowledged that the unarmed citizen is to be spared in

¹ Instructions for the Government of Armies of the United States in the Field, US Army General Order No. 100, 24 April 1863 (Lieber Code), Articles 5, 6.

² Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight, St Petersburg, 11 December 1868 (St Petersburg Declaration), preamble, paras. 3–6.

person, property, and honor as much as the exigencies of war will admit.³ That principle evolved over time to become the principle of distinction, which is the central pillar of the law of targeting and which is explained in Section E. As law evolved during the latter part of the nineteenth century, the focus tended to remain on prohibiting destruction not imperatively demanded by the necessities of war.⁴

In 1923, jurists developed some draft rules for the conduct of air warfare. The results of their labours were never adopted by States in legally binding form, but the draft rules remain an authoritative assessment of the state of the applicable law at the relevant time.⁵ As far as bombardment from the air was concerned, the jurists concluded, *inter alia*, that, in cases where lawful targets ‘cannot be bombarded without the indiscriminate bombardment of the civilian population, the aircraft must abstain from bombardment’.⁶ In the next paragraph, the jurists proposed: ‘In the immediate neighbourhood of the operations of land forces, the bombardment of cities, towns, villages, dwellings or buildings is legitimate provided that there exists a reasonable presumption that the military concentration is sufficiently important to justify such bombardment, having regard to the danger thus caused to the civilian population.’⁷ These were early formulations of ideas that in due course were to become the prohibition of indiscriminate attacks and the rule on proportionality, both of which are discussed in Section E.

The law on the resort to the use of armed force is largely set forth in the United Nations Charter. That document was signed in San Francisco on 26 June 1945. Determined ‘to save succeeding generations from the scourge of war’,⁸ the negotiators produced a text that places the maintenance of international peace and security at its core and which prohibits the use or threat of force subject to two limited exceptions. This is the body of law that is discussed in Section C.

The law of war had traditionally applied exclusively to situations of war existing between States, and the term ‘war’ was the subject of differing legal

³ Lieber Code, Article 22.

⁴ Consider, for example, Regulations Concerning the Laws and Customs of War on Land, Annex to Hague Convention IV Respecting the Laws and Customs of War on Land, The Hague, 18 October 1907 (Hague Regulations), Article 23(g). Note that Article 27 listed kinds of building regarded as protected.

⁵ General Report on the Revision of the Rules of Warfare, part II, Rules of Aerial Warfare, adopted unanimously by the Commission of Jurists, 19 February 1923 (Draft Hague Rules of Aerial Warfare).

⁶ Draft Hague Rules of Aerial Warfare, Article 24(3).

⁷ *Ibid.*, Article 24(4).

⁸ Preamble to the UN Charter.

interpretations. In 1949, with the adoption of the four Geneva Conventions of that year, the scope of application of the law was extended to situations of inter-State armed conflict. 'Armed conflict' was an altogether different notion to 'war', as the determination of whether an armed conflict is occurring involves a factual assessment of what is taking place. Some limited provision was also made in 1949 with regard to armed conflicts that are internal to a State. Then, in 1977, two treaties were adopted, both of which are described as being additional to the Geneva Conventions. The first of these, Additional Protocol I or API,⁹ applies to armed conflicts that are international in nature, meaning that they take place between States. The second, Additional Protocol II or APII,¹⁰ is a somewhat shortened version of API and applies to non-international armed conflicts, meaning conflicts internal to a State which take place between government armed forces and rebel forces of specified kinds that fulfil particular conditions. API included important rules on the law of targeting in Articles 48–71, and these rules remain the core of the law of targeting. The more limited rules in APII, though restricted in application, are of legal significance and have been much supplemented by the customary law rules that emerged beforehand and in the decades following the adoption of these treaties.

The fate of cultural property during warfare was a matter of particular and enduring concern. There had been specific provision in this regard in a number of the important treaties that were adopted during the 1899 and 1907 Peace Conferences held in The Hague. It was not until 1954, however, that a comprehensive convention on the protection of cultural property was adopted.¹¹

If, in recent years, environmental protection has become a global priority, early law of armed conflict treaties made little or no reference to the natural environment. Arguably, the first significant provision of that kind was a prohibition on the use of the environment as a weapon. This was in the context of forest and crop destruction operations by the United States during the Vietnam War and reported attempts by the same State during the same conflict to influence weather to its own advantage. The UN Environmental Modification Convention¹² plus the provisions within API

⁹ Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, Geneva, 8 June 1977.

¹⁰ Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts, Geneva, 8 June 1977.

¹¹ Convention for the Protection of Cultural Property in the Event of Armed Conflict, The Hague, 14 May 1954.

¹² Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, adopted at New York, 10 December 1976.

aimed at prohibiting high levels of incidental environmental damage during armed conflict¹³ are considered in Section E and, to the extent relevant, in Sections G and H.

The law relating to weapons has been the focus of much of the development in the law of armed conflict, at least as far as the adoption of new treaties is concerned, since 1977. Following a unilateral decision by the United States government to renounce the use of such weapons, a treaty was adopted that comprehensively prohibited most kinds of activity associated with biological weapons.¹⁴ It was followed by similarly comprehensive prohibitions covering chemical weapons,¹⁵ anti-personnel landmines¹⁶ and cluster munitions.¹⁷

The Diplomatic Conference that led to the adoption of API and APII¹⁸ recommended the convening of a separate conference to reach agreements on prohibitions and restrictions on the use of certain conventional weapons. At its second session, that later conference adopted the Conventional Weapons Convention.¹⁹ Under the auspices of that Convention, protocols were adopted addressing certain fragmentation weapons;²⁰ mines, booby-traps and other devices;²¹ incendiary weapons;²² and blinding laser weapons.²³ They included more detailed provisions in respect of mines, booby-traps and other devices.²⁴ All of these developments, in so far as they have relevance to nuclear weapon operations, are reflected in Section G below.

An often-neglected issue relates to States that are not parties to an international armed conflict. The law of neutrality was codified in the 1907 Hague

¹³ API, Articles 35(3), 55.

¹⁴ Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, opened for signature at London, Moscow and Washington DC on 10 April 1972.

¹⁵ Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, Paris, 13 January 1993.

¹⁶ Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction, Oslo, 18 September 1997.

¹⁷ Convention on Cluster Munitions, opened for signature at Oslo on 3 December 2008.

¹⁸ Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts, Geneva, 1974 to 1977.

¹⁹ Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Geneva, 10 October 1980.

²⁰ Protocol on Non-Detectable Fragments (Protocol I), Geneva, 10 October 1980.

²¹ Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices (Protocol II), Geneva, 10 October 1980.

²² Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol III), Geneva, 10 October 1980.

²³ Protocol on Blinding Laser Weapons (Protocol IV), Geneva, 13 October 1995.

²⁴ Amended Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices (Amended Protocol II), Geneva, 3 May 1996.

Conventions V²⁵ and XIII,²⁶ which continue to be the main authoritative sources.²⁷ Interestingly, the law of neutrality does not address the protection of neutral States against the damaging effects of the use of conventional weapons by the parties to an international armed conflict. In respect of the potential use of nuclear weapons, or of conventional weapons used against platforms either carrying nuclear weapons or that are nuclear-propelled, it is an open question whether and to what extent the protection of neutral States against the effects of such attacks is to be assessed in the light of the law of neutrality or general public international law.

It would be a mistake to think that treaty-making constitutes the only mechanism whereby the law that needs to be considered in connection with nuclear weapons has been clarified. In 2004, the International Committee of the Red Cross published an extensive assessment of the customary rules of international humanitarian law.²⁸ In 1995, the San Remo Manual on International Law Applicable to Armed Conflicts at Sea, produced by an international group of experts, was published. In 2010, an international group of experts prepared an international manual addressing the international law that applies to air and missile warfare,²⁹ and similarly produced international manuals on cyber warfare law and on the law relating to cyber operations more generally have followed.³⁰

In the related field of international criminal law, ad hoc tribunals were established to deal with, inter alia, war crimes, genocide and crimes against humanity committed during the armed conflicts in the former Yugoslavia³¹ and in Rwanda.³² A framework for the more global, and less ad hoc, prosecution of genocide, crimes against humanity, war crimes and, in time, aggression

²⁵ Convention (V) Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land, The Hague, 18 October 1907.

²⁶ Convention (XIII) Concerning the Rights and Duties of Neutral Powers in Naval War, The Hague, 18 October 1907.

²⁷ The expert manuals referred to in notes 29 and 30 below address the law of neutrality but are mainly reflective of the two 1907 Hague Conventions.

²⁸ International Committee of the Red Cross, *Customary International Humanitarian Law*, vol. 1, ed. J.-M. Henckaerts and L. Doswald-Beck (Cambridge University Press, 2005).

²⁹ *Manual on the International Law Applicable to Air and Missile Warfare*, Program on Humanitarian Policy and Conflict Research at Harvard University, March 2010.

³⁰ *Tallinn Manual on the International Law Applicable to Cyber Warfare*, ed. M. N. Schmitt (Cambridge University Press, 2013); *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations*, ed. M. N. Schmitt and L. Vihul (Cambridge University Press, 2017).

³¹ Statute of the International Criminal Tribunal for the Former Yugoslavia, UN Security Council Resolution 827, 25 May 1993.

³² Statute of the International Criminal Tribunal for Rwanda, UN Security Council Resolution 955, 8 November 1994.

was established with the adoption of the Rome Statute of the International Criminal Court.³³

In the mid-1990s the International Court of Justice was asked to give an opinion on the legality of the threat or use of nuclear weapons. Its resulting Advisory Opinion will be considered at some length in Section J. More recently, a treaty prohibiting nuclear weapons was adopted in 2017.³⁴ Following the deposit of the fiftieth instrument of ratification, the treaty entered into force on 22 January 2021. Clearly, the text is of great potential relevance to the topic of this book and will therefore be specifically addressed in Section K.

Although none of the treaties and expert manuals referred to above explicitly addresses nuclear weapons, the law on arms control and disarmament does, of course, regulate, on a multilateral level, the (non-)proliferation of nuclear weapons³⁵ (together with a safeguards regime³⁶) and even the prohibition of nuclear weapons.³⁷ At a bilateral level, the United States and the Russian Federation (formerly USSR) agreed on the reduction of strategic,³⁸ intermediate- and shorter-range missiles³⁹ and anti-ballistic missiles systems,⁴⁰ and these agreements were supplemented by regulations on confidence-building measures. In the light of the current position of the Russian Federation and the United States vis-à-vis bilateral agreements on nuclear arms reduction, and because of the reluctance of, for instance, the People's Republic of China to become part of such a regime, nuclear disarmament and arms control will most

³³ Rome Statute of the International Criminal Court, Rome, 17 July 1998.

³⁴ Treaty on the Prohibition of Nuclear Weapons, New York, 7 July 2017.

³⁵ Treaty on the Non-Proliferation of Nuclear Weapons, London, Moscow and Washington DC, 1 July 1968.

³⁶ The safeguards system under the responsibility of the International Atomic Energy Agency (IAEA) consists of safeguards agreements between States and the IAEA.

³⁷ Treaty on the Prohibition of Nuclear Weapons, New York, 7 July 2017.

³⁸ Strategic offensive arms are nuclear weapons with a range exceeding 5,500 kilometres and their reduction is regulated in a series of bilateral treaties between the Russian Federation and the United States. The last of those bilateral treaties is the Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START), Prague, 8 April 2010. The duration of New START was limited until 5 February 2021. In January 2021, the parties agreed on an extension for a further five years.

³⁹ Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty), Washington, 8 December 1987. Because of the United States' withdrawal, the INF Treaty expired on 2 August 2019.

⁴⁰ Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty), Moscow, 26 May 1972. The United States withdrew from the ABM Treaty, thus terminating the treaty as of June 2002.

likely be governed only by the Treaty on the Non-Proliferation of Nuclear Weapons, the Treaty on the Prohibition of Nuclear Weapons and, occasionally, by UN Security Council resolutions. Disarmament and arms control law is dealt with in Section K.

A.2 THE PURPOSE OF THE BOOK

As the preceding paragraphs demonstrate, the development of the bodies of law that are of relevance to nuclear weapons has not been linear. Some treaties have been a response to particular events, while others have followed national initiatives. There are undoubted gaps in the law, but the purpose of the present book is to examine the lawfulness of nuclear weapons, their possession, their use and deterrence policies associated with them, and the fulfilment of that purpose requires an objective consideration of the law we have. The book will focus on treaty law, on certain stated positions of States, on international court judgments of greatest relevance, on influential international manuals that have been the product of collective expert authorship and on other sources of similar standing. The views of individual commentators will not generally be addressed.

The objective in tackling the topic in this way is to seek to identify the duties that States must fulfil in the command and control of, and in communications relating to, nuclear weapons.

This will be the topic of Section L, and it will extend to considering deterrence and use of nuclear weapons, as well as operations that target nuclear weapons and capabilities. It is hoped that the method of analysis will amply justify the conclusions reached and that the whole book will bring clarity to a topic where, in the view of the authors, such clarity is of the utmost importance.

A.3 A SECTION-BY-SECTION DESCRIPTION OF THE BOOK

Accordingly, after this introductory Section A, certain important preliminary legal matters that are of relevance to any discussion of nuclear weapon issues will be reviewed in Section B. Thereafter, the law pertaining to the resort to force, specifically nuclear force, will be examined in Section C. In Section D the important distinction between international and non-international armed conflict is made, with the vital characteristics of each being detailed. It would seem likely that the use of nuclear weapons is a more realistic, though no less unacceptable, prospect in the former class of conflict, but the undertaking of military operations against a nuclear weapon facility,

which is also included within our notion of nuclear operations, cannot be excluded as a possible feature of the latter class of conflict.

Section E seeks to show how the law pertaining to the conduct of hostilities that applies when use is made of conventional weapons is also applicable in respect of nuclear operations. In a similar vein, Sections F and G consider the application of, respectively, neutrality law and the law relating to weapons in relation to nuclear operations. No book of this nature would be complete without considering international criminal law and its potential application to the topic. Indeed, given the widespread revulsion, a nuclear attack is likely to occasion, a wish to pursue criminal charges is highly foreseeable. The possible options are laid bare in Section H. States do not generally say a great deal about their nuclear policies or, for that matter, their views on how the law applies to nuclear weapon activities. What little material the authors have been able to access is summarised in a short Section I.

The International Court of Justice considered the legality of the threat or use of nuclear weapons a quarter of a century ago and reached conclusions that, to put it kindly, did not secure universal admiration from commentators. The interesting question to consider is whether, if the question were re-submitted to the Court, the somewhat changed circumstances twenty-five years on might be expected to cause the Court to reach a significantly different conclusion. That is the topic addressed in Section J. As was noted earlier, the Treaty on the Prohibition of Nuclear Weapons has since been adopted, in 2017. Section K addresses the provisions of that arms control treaty article by article, discusses its likely impact on the subject of this book and briefly examines the prospects of arms control law.

Tentative conclusions on the implications to be drawn from the analyses in the different Sections of the book will be brought together in Section L with a view to identifying the important features that an NC₃ mechanism must have if it is to be fit for purpose. In brief, the purpose of such a mechanism should be to ensure that nuclear weapons are only ever used as an absolutely last resort; that every possible step to prevent and avoid their use is taken; that systems are in place to ensure that those steps are indeed as likely as possible to successfully prevent the resort to nuclear weapons; that confusion, ambiguity, uncertainty, miscommunication and any other source of reduced clarity are, as far as possible, weeded out of such systems; and, finally, that all nuclear weapon-armed States have the best possible NC₃ systems and that they benefit from mutual assurance that other similarly armed States also possess such efficient systems. If global peace is still a long way off, global security in respect of nuclear weapons ought to be given the highest international priority.

Readers will note that Sections C, D, E and F follow the Tallinn Manual approach in terms of the sequencing of topics, the black letter rule and associated commentary layout and, to a degree, the legal perspectives set forth in the Commentaries and Rules. This is hardly surprising given the authors' central, though shared, roles in the development of that Manual.

That said, the Rules and Commentaries prepared below reflect the characteristics and contexts specific to nuclear weapons. The authors nonetheless wish to place on record their appreciation of the scholarship of the Tallinn experts.

A.4 THE INTENDED READERSHIP

This book will be of interest to anyone who is involved with, or interested in, the development of nuclear weapons; the maintenance of nuclear deterrent capabilities; the generation and updating of nuclear weapon-related policies; or any aspect of the law as it applies to the development, possession and use of nuclear weapons and deterrence policies relating thereto. It will also interest academics, members of think-tanks, policy advisors and others in the legal and policy communities whose responsibilities require them to understand the current law applying to nuclear weapons.

A.5 CERTAIN TERMS AND ABBREVIATIONS

The following abbreviations have the meanings given below:

AMW Manual: *Manual on the International Law Applicable to Air and Missile Warfare* (Program on Humanitarian Policy and Conflict Research at Harvard University, March 2010).

API: Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, Geneva, 8 June 1977.

APII: Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts, Geneva, 8 June 1977.

API Commentary: International Committee of the Red Cross, *Commentary on the Additional Protocols of 8 June 1977*, ed. Y. Sandoz, C. Swinarski and B. Zimmermann (Martinus Nijhoff, 1987).

Canadian Manual: Office of the Judge Advocate General, *Law of Armed Conflict at the Operational and Tactical Levels*, Doc. B-GJ-005-104/FP-021 (2001).

- CCW:** Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Geneva, 10 October 1980.
- Commentary on GCI (2016):** International Committee of the Red Cross, *Commentary on the First Geneva Convention*, ed. K. Dörmann, L. Lijnzaad, M. Sassòli and P. Spoerri (Cambridge University Press, 2016).
- Galić Trial Chamber Judgment:** *Prosecutor v. Stanislav Galić*, International Criminal Tribunal for the Former Yugoslavia Case IT-98–29-T (Trial Chamber Judgment of 5 December 2003).
- GCI:** Geneva Convention I for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, Geneva, 12 August 1949.
- GCII:** Geneva Convention II for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea, Geneva, 12 August 1949.
- GCIII:** Geneva Convention Relative to the Treatment of Prisoners of War, Geneva, 12 August 1949.
- GCIV:** Geneva Convention Relative to the Protection of Civilian Persons in Time of War, Geneva, 12 August 1949.
- Hague Convention V:** Convention Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land, The Hague, 18 October 1907.
- Hague Convention XIII:** Convention Concerning the Rights and Duties of Neutral Powers in Naval War, The Hague, 18 October 1907.
- Hague Regulations:** Regulations Concerning the Laws and Customs of War on Land, Annex to Hague Convention IV Respecting the Laws and Customs of War on Land, The Hague, 18 October 1907.
- German Manual:** Federal Ministry of Defence of the Federal Republic of Germany, *Humanitarian Law in Armed Conflicts: Manual*, ZDv 15/2 (1992).
- ICJ Corfu Channel Judgment:** *Corfu Channel Case (United Kingdom v. Albania)* (Judgment of 9 April 1949) [1949] ICJ Rep. 4.
- ICJ Genocide Judgment:** *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro)* (Judgment of 26 February 2007) [2007] ICJ Rep. 43.

- ICJ Nicaragua Judgment:** *Military and Paramilitary Activities in and against Nicaragua* (*Nicaragua v. United States*) (Judgment of 27 June 1986) [1986] ICJ Rep. 14.
- ICJ Nuclear Opinion:** *Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion of 8 July 1996) [1996] ICJ Rep. 226.
- ICJ Oil Platforms Judgment:** *Oil Platforms* (*Iran v. United States*) (Judgment of 6 November 2003) [2003] ICJ Rep. 161.
- ICJ Tehran Hostages Judgment:** *United States Diplomatic and Consular Staff in Tehran* (*United States v. Iran*) (Judgment of 24 May 1980) [1980] ICJ Rep. 3.
- ICRC Customary Law Study:** International Committee of the Red Cross, *Customary International Humanitarian Law*, vol. 1, ed. J.-M. Henckaerts and L. Doswald-Beck (Cambridge University Press, 2005).
- NIAC Manual:** International Institute of Humanitarian Law, *The Manual on the Law of Non-International Armed Conflict*, ed. M. N. Schmitt, C. H. B. Garraway and Y. Dinstein (2006).
- Oslo Manual:** *Oslo Manual on Select Topics of the Law of Armed Conflict*, ed. Y. Dinstein and A. W. Dahl (Springer, 2020).
- Rome Statute:** Rome Statute of the International Criminal Court, Rome, 17 July 1998.
- San Remo Manual:** International Institute of Humanitarian Law, *San Remo Manual on International Law Applicable to Armed Conflicts at Sea*, ed. L. Doswell-Beck (1995).
- Tadić Appeals Chamber Judgment:** *Prosecutor v. Tadić*, International Criminal Tribunal for the Former Yugoslavia Case IT-94-1-A (Appeals Chamber Judgment of 15 July 1999).
- Tallinn Manual 2.0:** *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations*, ed. M. N. Schmitt and L. Vihul (Cambridge University Press, 2017).
- UK Manual:** UK Ministry of Defence, *Manual of the Law of Armed Conflict* (Oxford University Press, 2004) as subsequently amended.
- US DoD Law of War Manual:** US Department of Defense, *Department of Defense Law of War Manual* (June 2015), as subsequently amended.

For the purposes of this book, the term ‘nuclear operation’ covers all activities involving the use, or threatened use, of nuclear weapons, nuclear deterrent activities and all actions whose purpose is to target nuclear weapons and nuclear equipment as such, including their command, control and communications systems.

A.6 WHAT ARE NUCLEAR WEAPONS?

A nuclear weapon is a device designed to release energy in an explosive manner due to nuclear fission, nuclear fusion or a combination of those processes. Fission weapons are also referred to as atomic weapons or, more usually, atomic bombs. Fusion weapons are also called thermonuclear bombs or hydrogen bombs. The explosive blast energy is usually measured in terms of a comparison with the quantity of conventional TNT explosive that would be required to produce an equivalent amount of energy. The measures used are the kiloton, equivalent to 1,000 tons of TNT, and the megaton, equivalent to 1,000,000 tons of TNT.

In very broad terms, the process of nuclear fission consists of the bombardment of certain isotopes of uranium and plutonium by neutrons, causing them to split into atoms of lighter elements. In addition, free neutrons are emitted in the fission process and explosive energy is generated. Nuclear fusion consists of the joining or fusing of the nuclei of two atoms to form a single, heavier atom. Such a process, performed at particularly high temperatures and involving the use of isotopes of hydrogen, can cause the release of large amounts of energy. In those high temperatures, the energy associated with the movement of the nuclei causes them to get close enough together for what is called the strong force to attract and fuse the nuclei. The necessary temperatures and the density of the fusion materials are both achieved by a fission explosion.

The blast from a nuclear weapon produces a shock wave, vast amounts of heat and ionising radiation. Radioactive debris can be thrown high into the atmosphere, later falling to the Earth's surface as radioactive nuclear fallout.

The use of a nuclear weapon is likely to have catastrophic effects: very large numbers of persons are likely to be killed; areas of the Earth's surface would be rendered unfit for human habitation or use; and there would likely be serious illness among those affected by the fallout. While the earliest nuclear weapons were air-delivered, in more recent times nuclear weapons have more usually employed ballistic missiles. Tactical nuclear weapons may use artillery, landmine, depth-charge, torpedo, cruise missile or ballistic missile technology.

The United States, the Russian Federation, France, the United Kingdom and China all have significant numbers of nuclear warheads. Israel, India, Pakistan and North Korea are all also known to have nuclear weapon capabilities. Yet other States are believed to have nuclear weapon development programmes.

Enhanced radiation warheads, or neutron bombs, consist of low-yield (approximately one kiloton) thermonuclear devices, so designed as to intensify

the production of lethal fast neutrons and thereby increase the numbers of fatalities while limiting damage to structures. Such technology might be employed in anti-ballistic missiles, short-range ballistic missiles and artillery shells, for example.

The very large amounts of energy they generate, the extreme levels of heat they produce and the radiation their explosions cause mark out nuclear weapons from conventional weapons. Factors that will determine the nature and extent of the impact of a nuclear weapon include whether it is a fission or fusion weapon and the yield; whether the explosion takes place in the air, on the surface, subsurface or under water; the meteorological and environmental conditions; and whether the location of the explosion is urban, rural or military in nature. The consequences of a nuclear explosion are a fireball, a shock wave (air blast), heat and radiation.⁴¹

Discussion of low-yield nuclear weapons is far from academic. Russia is believed to be investing heavily in such technologies. Reportedly, a new nuclear warhead requested by, and designed and produced for, the US government was deployed aboard the USS *Tennessee*, a submarine, at the end of 2019. The W76-2 is said to be a low-yield variant of the nuclear warhead more usually used in the Trident missile.

Official U.S. nuclear-warhead yields remain classified, but experts estimate that the new W76-2 would explode with a yield of about 6.5 kilotons, whereas the full-size W76-1 explodes with a yield of roughly 90 kilotons. By comparison, the warheads the U.S. military used on Hiroshima and Nagasaki, Japan, in 1945 exploded with about 15 and 20 kilotons of force, respectively.⁴²

Clearly, though described as ‘low yield’, the W76-2 remains a most potent weapon, likely to cause very numerous casualties, widespread devastation and very damaging fallout, while also either triggering or constituting the response to other nuclear strikes – perhaps proportionate perhaps not – by the adversary. It remains to be seen whether very much smaller-yield nuclear weapons will be developed and fielded in future years. If, however, a trend of reducing yields can be identified, it seems sensible not to limit the present discussion to strategic, very large-scale strikes. Accordingly, the law as it applies to targeted attacks will be considered to the extent that it appears relevant.

⁴¹ This brief description of nuclear weapons draws heavily on the *Encyclopaedia Britannica* entry ‘Nuclear weapon’ by T. B. Cochran and R. S. Norris, www.britannica.com/technology/nuclear-weapon (viewed 13 February 2020).

⁴² P. Sonne, ‘U.S. military arms its submarines with new “low-yield” nuclear warheads’, *Washington Post*, 4 February 2020; A. Mehta, ‘Trump’s new nuclear weapon has been deployed’, *Defense News*, 4 February 2020.