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The XM25 Individual Airburst Weapon System: A 'Game Changer' for the (Law on the) Battlefield? Revisiting the Legality of Explosive Projectiles under the Law of Armed Conflict

Tom Ruys[*]

In the summer of 2010, the US Army began the field-testing of a new weapon, the XM25 'Individual Semi-Automatic Airburst System', which fires 'airburst' anti-personnel rounds that can be programmed to detonate at a certain distance. While the XM25 has been heralded as a 'game changer' for modern warfare, the question nonetheless remains to what extent it is compatible with the law of armed conflict (LOAC). Against this background, this article aims to examine the legality of the XM25, in particular having regard to the customary prohibition on certain explosive projectiles and the general prohibition on causing superfluous injury and unnecessary suffering.

Keywords: law of armed conflict/IHL, law of weaponry, St Petersburg Declaration, explosive bullets, exploding projectiles, grenade, airburst ammunition, XM25, prohibition of superfluous injury/unnecessary suffering

1. Introduction: The XM25 – A 'Game Changer' on the Battlefield … But What About the Law on the Battlefield?

After several years of intensive research and development by manufacturers Heckler & Koch and Alliant Techsystems, the XM25 has recently entered the engineering and manufacturing development phase. The XM25 is a semi-automatic, shoulder-fired, man-portable firing weapon, weighing some 6 kg and shooting 25 mm 'airburst' anti-personnel rounds that detonate in mid-air.[1] The weapon has a 500 metre range against point targets and a 500–700 metre range against area targets.[2] What sets the XM25 apart from other weapons is its ability to accurately detect and determine range to targets, and to subsequently programme the 25 mm 'airbursting' anti-personnel rounds via a wiring harness in the weapon to explode at a predetermined range, causing airburst-effect shrapnel damage to the enemy. Given these features, the weapon can be used to attack persons hiding behind walls or other obstacles, or in foxholes or ditches.[3] Thus, soldiers handling the weapon can use the laser rangefinder to determine the distance to the said wall or

[*] Dr Tom Ruys is Senior Researcher at the Leuven Centre for Global Governance Studies and lawyer at the Brussels Bar (Stibbe). The author wishes to thank Major Johan Gallant (Ballistics Lecturer at the Belgian Royal Military School), Mr Bruno Demeyere, as well as the two anonymous reviewers, for their helpful comments and suggestions. All opinions expressed remain the author's own. Email: tom.ruys@ggs.kuleuven.be.

[1] ATK, 'XM25 Counter Defilade Target Engagement System', May 2009, http://www.atk.com/capabilities_space/documents/sw_iw_xm25.pdf.

[2] 'XM25 Individual Semi-automatic airburst system (ISAAS)', http://www.globalsecurity.org/military/systems/ground/m25.htm.

[3] See also Dan Whitworth, 'US Military Unveils "Smart Gun"', *BBC Newsbeat* (30 November 2010).

ditch. They can then manually adjust the detonating distance to up to three metres from the calculated range; the XM25 automatically transmits the detonating distance to the round in the firing chamber. In practice, this means that when an enemy is hiding in a ditch, the soldier can programme the round to explode above that ditch. When an enemy is hiding behind a wall, the round can be programmed to be fired above the wall (or through a window in the wall), and subsequently explode one or two metres from that wall (depending on the estimated location of the enemy).

The military advantage of the XM25 is obvious. As the first small arms weapon using 'smart' technology, it greatly increases hit probability and lethality when engaging hostiles in defilade. Thus, Alliant Techsystems prides itself on the fact that the individual airburst weapon system provides the soldier with a 300 to 500 per cent increase in hit probability and is five times more lethal than the M203, a 'traditional' rifle-mounted grenade launcher firing (non-airburst) 40 mm rounds.[4] In the past, when confronted with enemy fighters in defilade, soldiers generally had a choice between manoeuvring from their own cover position (under enemy fire) to gain an advantageous firing spot for the enemy, or to use mortars or artillery, or to call for air support. Consequently, the weapon reduces the need for exposure of the soldiers handling the XM25, since they may stay behind cover. Furthermore, given its accuracy and lower destructive impact, the weapon may also lead to a reduction in damage, both in terms of human lives (specifically collateral damage) and property damage, normally caused by mortars, artillery and air strikes. In practical terms, there are also important gains in terms of both time and money. Exchanges of fire that used to go on for a considerable amount of time may now be settled in a matter of minutes. With an estimated cost of some US$25–35 apiece,[5] the XM25's airburst rounds are evidently far cheaper than any of the existing alternatives.

In the summer of 2010, the US Army began to field test the XM25 Individual Semi-Automatic Airburst System on the Afghan battlefield. US troops who were asked to try out the newly developed weapon in Afghanistan were reportedly highly enthusiastic about its effectiveness at neutralising enemies firing from covered positions.[6] The US Army has announced plans to purchase numerous XM25s to have more units fielded with them by 2012–13.[7]

It is clear then, as military experts have asserted, that the XM25 is potentially a 'game changer' in infantry warfare,[8] removing the advantage that an enemy enjoys in guerrilla and urban warfare scenarios – that is, the ability to engage forces from within cover.

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[4] 'Individual Airburst Weapon System (IAWS)', http://www.atk.com/capabilities_defense/cs_ms_w_fp_IAWS.asp.

[5] The current price per bullet is alleged to amount to several hundred dollars (since bullets have to be made by hand at the moment), yet is expected to fall to as low as US$25 once ATK switches to automated production: 'Magic Bullets: Smart Ammunition is About to Make Things a Lot More Dangerous for Guerrillas Fighting Regular Troops', *The Economist* (14 January 2012) ('Magic Bullets').

[6] ibid; C Todd Lopez, 'Army Wants 36 More "Punisher" Weapons in 2012' (8 February 2011), http://www.army.mil/article/51518/.

[7] ibid.

[8] eg, Mark Whittington, 'XM25 Counter Defilade Target Engagement System Deployed to Afghanistan. "Game Changing" Infantry "Smart" Grenade Launcher' (1 December 2010), http://www.associatedcontent.com/article/6075454/xm25_counter_defilade_target_engagement.html?cat=15.

Against this background, the present article addresses an issue which does not appear to have attracted attention so far, notably the compatibility of the XM25 airburst rounds with the law of armed conflict, and in particular its compatibility with the customary prohibition of certain explosive projectiles and the general prohibition of superfluous injury and unnecessary suffering (the 'SIrUS' principle).

Before embarking on an analysis of the legal framework, however, two preliminary observations are in order. First, it should be observed that the XM25 is already inspiring imitation and that several other companies and countries are working on similar weapon systems that fire 'airburst' anti-personnel rounds.[9] *Mutatis mutandis*, the legal findings spelled out in the present article apply also to other individual airburst weapon systems with similar features.[10]

Second, it is well known that the law of weaponry consists of (i) a substantive body of conventional and/or customary rules prohibiting or regulating the use and/or possession or manufacture of specific means of warfare, on the one hand, and (ii) a set of overarching principles of general application, on the other. The application of the two sets of norms may result in a specific means of warfare being prohibited per se, or it may, alternatively, result in certain *uses* of the weapon being unlawful, without affecting the legality of the weapon in absolute terms. Furthermore, the existence of explicit prohibitions barring the use of certain weapons 'does not exhaust the meaning of the legal principle'.[11] Rather, the two sets of rules need to be examined in parallel. Starting from the *lex specialis* norm of the 1868 St Petersburg Declaration (referred to here as 'the St Petersburg rule'), Section 2 focuses on the per se prohibition of certain explosive projectiles in customary international law. Section 3 then examines the extent to which the SIrUS principle (or a specific customary rule derived from the SIrUS principle) may set limits on the *use* of the XM25 in concrete situations. It must be stressed, however, that the St Petersburg rule is inextricably linked with the SIrUS principle, of which it is in fact an expression, implying that the two analyses cannot be considered in strict isolation. For the sake of completeness, Section 4 briefly looks at the principle of discrimination and the proportionality principle. Section 5 spells out some concluding observations.

[9] See, eg, 'Magic Bullets' (n 5). On the US Army's weapons programme resulting in the development of the XM25 (and its relationship with the XM29 and the XM307), see Anthony G Williams, 'New Developments in Grenade Ammunition' (14 November 2010), http://www.quarry.nildram.co.uk/grenades.htm.

[10] On the other hand, while ATK has indicated in the past that it was also in the process of developing other types of ammunition for use with the XM25, including armour-piercing rounds that could be used, for example, against lightly armoured vehicles (see ATK, 'XM25 Counter Defilade Target Engagement System', May 2009, http://www.atk.com/capabilities_space/documents/sw_iw_xm25.pdf), the present analysis is concerned exclusively with the high-explosive airburst rounds described above, which are used for anti-personnel purposes and which have no ostensible anti-materiel relevance.

[11] Roger S Clark, 'Methods of Warfare that Cause Unnecessary Suffering or are Inherently Indiscriminate: A Memorial Tribute to Howard Berman' (1997–98) 28 California Western International Law Journal 379, 385.

2. THE PER SE PROHIBITION OF CERTAIN EXPLOSIVE PROJECTILES UNDER CUSTOMARY INTERNATIONAL LAW

2.1 THE 1868 ST PETERSBURG DECLARATION

2.1.1 BACKGROUND

The obvious starting point for an analysis of the legal framework concerning explosive projectiles and other small arms ammunitions is undoubtedly the 1868 St Petersburg Declaration.[12] This Declaration finds its origin in the introduction, in the second half of the nineteenth century, of rifle bullets that explode on impact with hard surfaces. Explosive anti-materiel bullets of this type were deemed to be of significant military value, among other things, because they could be used to blow up ammunition wagons of the adversary. However, when a further modification of the new bullets resulted in their exploding upon contact, even with a soft surface such as the human body, this led to concerns that such (anti-personnel) projectiles inflicted far greater suffering than was needed to render enemy combatants *hors de combat*. In other words, it was thought that there was no military justification for the particularly harmful/lethal character of such bullets.

2.1.2 THE PROHIBITION OF SUPERFLUOUS INJURY OR UNNECESSARY SUFFERING (THE SIRUS PRINCIPLE)

Against this background, the Russian Czar, concerned with the well-being of his troops, took the initiative of convening an international conference at St Petersburg. The resulting Declaration was not only the first international agreement to prohibit the use of a particular weapon in warfare, but it was also groundbreaking in that it explicitly put forward an overarching prohibition of 'unnecessary suffering' or '*maux superflus*':

> [Considering 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 humanity.

The SIrUS principle[13] was explicitly recast in the 1899 and 1907 Hague Regulations, which forbade (in French) '*d'employer des armes, des projectiles ou des matières propres à causer des*

[12] 1868 St Petersburg Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight, reprinted in Adam Roberts and Richard Guelff (eds), *Documents on the Laws of War* (3rd edn, Oxford University Press 2000) 53.
[13] On the prohibition against unnecessary suffering, see, eg, William H Boothby, *Weapons and the Law of Armed Conflict* (Oxford University Press 2009) 55–68.

maux superflus'.[14] More recently, it was enshrined in Article 35(2) Additional Protocol I,[15] which has also extended its scope to 'methods of warfare': 'It is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering'.[16]

The 'unnecessary suffering' principle serves as a useful reminder that the international law of armed conflict essentially boils down to a perennial quest for a balance between the dictates of humanity and the imperatives of military necessity. Thus, as indicated by the International Court of Justice (ICJ), the essential question is whether the use of a weapon/projectile causes a harm '*greater than that unavoidable* to achieve legitimate military objectives'.[17] It follows from this statement that the foreseeable degree of suffering to be expected from the use of a particular weapon must not be considered in isolation. Rather, the degree of suffering must be balanced against the alternative options. Two issues arise in particular: (i) whether an alternative weapon is available, causing less injury or suffering; and, shifting the focus, (ii) whether the effects produced by the alternative weapon are sufficiently effective in achieving the military objective sought.[18]

Even if the SIrUS principle has been identified as 'one of the cardinal principles of international humanitarian law' by the ICJ,[19] its application is fraught with problems. This arises from a variety of factors, including the fact that suffering is often difficult to quantify in medical terms, or the fact that the SIrUS assessment may change over time as military technology evolves. In addition, views differ as to the relevant criteria to determine whether the SIrUS rule has been violated.[20]

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[14] Art 23(e), Regulations concerning the Laws and Customs of War on Land, annexed to the Fourth 1907 Hague Convention respecting the Laws and Customs of War on Land (entered into force 26 January 1910) Martens Nouveau Recueil (ser 3) 461. Translation: 'weapons, projectiles and materials calculated to/of a nature to cause superfluous injury or unnecessary suffering'. On the difference between the non-binding English translations of the 1899 Hague Regulations and the 1907 Hague Regulations, see n 16.

[15] First Additional Protocol to the Geneva Conventions and relating to the Protection of Victims of International Armed Conflicts (entered into force 7 December 1979) 1125 UNTS 3 (Additional Protocol I).

[16] By pointing at the 'nature' of the weapon (as in the non-binding English translation of the 1899 Hague Regulations), rather than it 'being calculated to' cause superfluous injury or unnecessary suffering (as in the English translation of the 1907 Hague Regulations), art 35(2) of Additional Protocol I (ibid) makes clear that one should focus on the objective character of the weapon, rather than on the subjective intention of whoever is handling it. See, eg, Yoram Dinstein, *The Conduct of Hostilities under the Law of International Armed Conflict* (2nd edn, Cambridge University Press 2010) 64.

[17] *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion [1996] ICJ Rep 266 [35] (*Nuclear Weapons*) (emphasis added).

[18] Dinstein (n 16) 65.

[19] *Nuclear Weapons* (n 17) [35].

[20] One, though by no means the only, view found proposes the application of a proportionality test between the foreseeable suffering, on the one hand, and the military advantage intended from the use of a certain weapon or technique, on the other. cf, for example, Stefan Oeter, 'Methods and Means of Combat' in Dieter Fleck (ed), *The Handbook of International Humanitarian Law* (Oxford University Press 2008) 130, para 402(2) with Dinstein (n 16) 65: 'Proportionality … has nothing to do with injury or suffering sustained by combatants'. In any case, it is important not to confuse the arguments regarding the applicability of some sort of proportionality reasoning to determining the legality of weapons as per the SIrUS rule with the principle of proportionality proper, as understood in the law of targeting.

In practice, states are reluctant to recognise the principle as an *autonomous* ground for outlawing specific weapons per se. On the other hand, the SIrUS rule is regarded 'as a guiding principle upon which specific prohibitions or restrictions can be built'.[21] It has indeed been the underpinning motivation of numerous legal instruments regulating and/or prohibiting the use of a variety of weapons, such as, for instance, blinding laser weapons or dum-dum bullets.[22] In addition, even if (absent *lex specialis*) the SIrUS rule will, in principle, not render a particular weapon illegal per se, it does provide a useful conceptual framework to assess the legality of a particular weapon's use in a concrete situation.[23] In short, the principle sets limits on the *use* of weapons in concrete circumstances. Whether it also does so in respect of the XM25 is examined below in Section 3.

2.1.3 The St Petersburg Rule

Apart from explicitly denouncing unnecessary suffering as a matter of principle, the participants in the St Petersburg Conference also agreed to a per se prohibition of particular types of explosive projectile, which is in fact a specific reflection of the SIrUS rule. In doing so, they opted for a practical and pragmatic approach. On the one hand, they agreed that the use of explosive rifle bullets inflicted graver sufferings on individual soldiers than was strictly necessary to disable them, and should therefore be banned. At the same time, they were unwilling to relinquish the use of artillery shells, which, in spite of their devastating effects, were deemed to carry considerable military advantages, both against 'hard' targets such as fortified positions, and also against 'soft' targets, since they could be used to eliminate a number of men at a stroke.[24] 'Therefore, no matter how serious the injury they could inflict on individual soldiers, they were indispensable and there could be no question of their being sacrificed on the altar of "humanity"'.[25] The compromise solution (the St Petersburg rule) was a straightforward and highly practicable one. Considering that 400 g was the weight of the smallest artillery shell at the time, states decided to outlaw in absolute terms the use of all explosive projectiles below such weight:

> The Contracting Parties engage mutually to renounce, in case of war among themselves, the employment by their military or naval troops of any projectile of a weight below 400 grammes, which is either explosive or charged with fulminating or inflammable substances.

[21] UK Ministry of Defence, *The Manual of the Law of Armed Conflict* (Oxford University Press 2004) 103, para 6.1.5.
[22] At the same time, the mere fact that a weapon is subject to a prohibition or restriction in international law, be it customary or conventional, does not necessarily imply that that weapon breaches the superfluous injury principle: Boothby (n 13) 60.
[23] cf, as indicated above, art 35(2) of Additional Protocol I (n 15) also mentions that it is prohibited to employ 'methods of warfare of a nature to cause superfluous injury or unnecessary suffering'.
[24] Frits Kalshoven, 'Arms, Armaments and International Law' (1985) Recueil des Cours 191, 208.
[25] ibid.

Thus, the dividing line between permissible and impermissible explosive projectiles was, in effect, a line between explosive artillery and rifle munitions, the latter remaining the most important 'single enemy' munition.[26] The newly developed rifle bullets remained far below that limit, whereas the existing artillery shells were considerably heavier. The St Petersburg Declaration was signed by 17 states, including France, the UK and Russia. Three other states acceded later.[27]

2.1.4 XM25 AIRBURST ROUNDS: A PRIMA FACIE VIOLATION OF THE ST PETERSBURG RULE?

Judging by the original St Petersburg rule, airburst ammunition of the type used by the XM25 would at first sight appear to be unlawful. Indeed, considering that this ammunition contains a high explosive component and disperses shrapnel upon detonation, and considering that the concept of 'explosive projectile' is not further defined in the St Petersburg Declaration, it can be assumed that the XM25 airburst rounds must indeed be regarded as 'explosive projectiles' in the generic sense. Furthermore, although the exact weight of the 25 mm rounds has not been made public, there are sufficient indications to conclude that the rounds are, in all likelihood, well below 400 g.[28]

On the other hand, considering that the United States itself did not accede to the St Petersburg Declaration, and taking into account the fact that it was adopted more than 120 years ago, this is clearly not the end of the analysis, but only the beginning. Indeed, in order to properly examine the legality of the XM25 airburst rounds, one must examine whether or not the 400 g limit laid down in the Declaration has become part of customary law, and, if so, to what extent it has been modified by customary practice in more recent decades.

2.2 EROSION OF THE PER SE PROHIBITION OF CERTAIN EXPLOSIVE PROJECTILES PURSUANT TO EVOLUTIONS IN CUSTOMARY PRACTICE

When looking at the available 'verbal' state practice,[29] it is tempting to conclude that the 400 g rule of the St Petersburg Declaration still represents valid general international law. First, several

[26] ibid 207–08.

[27] The ICRC customary study finds that the Declaration was adhered to by 'most of the States in existence at that time': Jean-Marie Henckaerts and Louise Doswald-Beck (eds), *Customary International Humanitarian Law, vol I: Rules* (International Committee of the Red Cross and Cambridge University Press 2009) (ICRC Study I). The United States, however, has objected that it 'actually represented [the practice] of less than half of the States then in existence' (see John B Bellinger III and William J Haynes II, 'A US Government Response to the International Committee of the Red Cross Study *Customary International Humanitarian Law*' (2007) 866 International Review of the Red Cross 462) because none of the African or East Asian States in existence at the time acceded to the Declaration.

[28] While the exact weight of the 25 mm rounds used with the XM25 is not made public, it may be noted that the weight of the 25 mm rounds used with the XM307 amounted to 132 g (see Williams (n 9)). In light hereof, it is assumed that the rounds used by various individual airburst weapon systems such as the XM25 remain below 400 g.

[29] For a discussion of the relevance of 'verbal' as compared to 'physical' practice, see Tom Ruys, *'Armed Attack' and Article 51 of the UN Charter: Evolutions in Customary Law and Practice* (Cambridge University Press 2010) 31–44 and the literature cited.

non-binding, yet authoritative, international instruments – such as the 1874 Brussels Declaration, the 1880 Oxford Manual and the 1913 Oxford Manual on Naval War – unequivocally copy its approach.[30] Second, and more interesting from a contemporary perspective, the 400 g limit is explicitly reiterated in a variety of modern-day national military manuals and national criminal laws. In terms of examples, the ICRC study on customary international humanitarian law (ICRC Study I and II) and the ICRC customary IHL database refer to military manuals and/or law of war manuals of Australia, Belgium, Canada, Italy, Ivory Coast, New Zealand, Russia, South Africa and Spain, as well as to the Italian Law of War Decree.[31] The Canadian Law of Armed Conflict Manual (2001), for example, states that the following type of ammunition is prohibited: 'projectiles of a weight below 400 g that are either explosive or charged with fulminating (exploding) or inflammable substances'. In a similar vein, the Russian Federation's Regulations on the Application of IHL (2001) prohibits the use in the course of combat operations of 'projectiles of a weight below 400 g, which are either explosive or charged with fulminating or inflammable substances'. Other law of war manuals, such as that of France, simply contain a general reference to the St Petersburg Declaration.[32]

At the same time, it is clear that when assessing the relevance of these instruments in terms of 'verbal' state practice and as reflections of states' *opinio juris*, one should not lose sight of developments in the 'physical' practice of states – in other words, the actual conduct of hostilities.

2.2.1 Permissibility of Explosive Ammunition in Aerial Warfare

Evolution in state practice and opinio juris

A first such development pertains to the emergence of aerial warfare in the early twentieth century. Indeed, from the very birth of aerial warfare, it was common for aircraft to be equipped with bullets that may detonate on impact with materiel. Such ammunition was used by states that participated in the First and Second World Wars and has been employed in numerous conflicts ever since.[33] The carving out of an exception for the use of explosive bullets in aerial warfare – not

[30] Project of an International Declaration concerning the Laws and Customs of War, 27 August 1874, art 13(e); The Laws of War on Land, 9 September 1880, art 9(a) (adopted by the Institute of International Law); Manual of the Laws of Naval War, 9 August 1913, art 16(2) (adopted by the Institute of International Law).

[31] Jean-Marie Henckaerts and Louise Doswald-Beck (eds), *Customary International Humanitarian Law, vol II: Practice* (International Committee of the Red Cross and Cambridge University Press 2005) (ICRC Study II) 1788–90, paras 8–11, 14–18, 24. See also the periodically updated ICRC Customary IHL database, http://www.icrc.org/customary-ihl/eng/docs/v2_rul_rule78. The 400 g limit is explicitly included, inter alia, in Australia's Commanders' Guide (1994), Australia's Defence Force Manual (1994), Belgium's Law of War Manual (1983), Canada's LOAC Manual (1999 and 2001), Italy's IHL Manual (1991), Ivory Coast's Teaching Manual (2007), New Zealand's Military Manual (1992), the Russian Federation's Military Manual (1990), the Russian Federation's Regulations on the Application of IHL (2001), South Africa's Revised Civic Education Manual (2004), and Spain's LOAC Manual (1996), http://www.icrc.org/customary-ihl/eng/docs/v2_rul_rule78.

[32] See ICRC Study II, ibid 1788, para 12.

[33] Bellinger III and Haynes II (n 27) 463. As the HPCR Manual on Air and Missile Warfare affirms, the rule of the St Petersburg Declaration has no application to the use of missiles since all missiles exceed the weight limitation: see HPCR, *Commentary on the HPCR Manual on International Law Applicable to Air and Missile Warfare*,

only in air-to-air combat, but also in air-to-ground combat – was confirmed in the 1923 Hague Rules of Air Warfare. According to Article 18 of that (non-binding, yet authoritative[34]) document, 'the use of tracer, incendiary or explosive projectiles by or against aircraft is not prohibited. This provision applies equally to States which are parties to the Declaration of St Petersburg, 1868, and to those which are not'.[35] The exception concerning the use of explosive projectiles below 400 g in aerial warfare is moreover reflected in some national practice. The Italian IHL Manual (1991) and the Italian Law of War Decree (1938), for example, refer to a prohibition 'to use explosive or incendiary projectiles of a weight below 400 g, except for air or anti-air systems'.[36] The UK military manual (1958) similarly mentions Article 18 of the 1923 Hague Rules.[37] It is also worth noting that ICRC Study I acknowledges that the introduction of explosive bullets in air warfare has modified the customary prohibition of certain explosive projectiles.[38]

XM25 airburst rounds

In any event, considering that the XM25 is used for land warfare, rather than aerial warfare, the above does not change much to the interim conclusion that airburst ammunition goes against the specific standard laid down by the St Petersburg Declaration. A second evolution in state practice is, however, of greater importance for present purposes.

2.2.2 The Permissibility of Anti-Materiel Explosive Projectiles

Evolution in state practice and opinio juris

Erosion of the St Petersburg rule has not remained confined to the domain of aerial warfare. Indeed, in land warfare there have also been major developments in terms of state practice curtailing the scope of the original per se prohibition of explosive projectiles below 400 g. In particular, ever since the First World War, a wide range of exploding anti-materiel bullets (40 mm and other calibers) have been introduced. These bullets have been used as ammunition for shoulder-fired weaponry as well as for more powerful automatic weapons used on tripods or vehicles. Explosive anti-materiel bullets carry undeniable military advantages. For instance, combined-effects bullets with an armour-piercing shell make it possible to penetrate lightly armoured targets (such as a vehicle or helicopter) and to cause damage to personnel inside the target after penetration (without causing the same degree of destruction as an artillery shell would).[39] In such a scenario, the impact with a hard surface (for example, the armour of a military

March 2010, 71 (*Commentary on the HPCR Manual*), http://ihlresearch.org/amw/Commentary%20on%20the%20HPCR%20Manual.pdf.

[34] See Boothby (n 13) 16.

[35] 1923 Hague Rules of Aerial Warfare, reprinted in Roberts and Guelff (n 12) 141.

[36] See ICRC Study II (n 31) 1788–90, paras 14, 24.

[37] ibid 1789, para 18.

[38] See ICRC Study I (n 27) 272–73.

[39] It is interesting to note that such combined-effects ammunition is explicitly excluded from the scope of the Third Protocol to the Convention on Conventional Weapons. According to art 1(1)(b)(ii) of Protocol III to the

vehicle) ignites the incendiary mixture in the projectile's nose and body, in turn setting off the high explosive component.

It is recalled here that, even if the St Petersburg Declaration was inspired by concerns over the introduction of rifle bullets that exploded on impact with a soft surface (such as a human body) (Section 2.1 above), the original St Petersburg rule provided for a categorical prohibition of all explosive projectiles of a weight below 400 g, without distinguishing between anti-personnel or anti-materiel projectiles. In spite of that, and as expressly acknowledged in ICRC Study I,[40] the introduction of exploding anti-materiel bullets following the First World War has occurred without objections from (or, perhaps, with a striking disregard by) legal scholars and, more importantly, without objections from states. The implication is that, even if many military manuals still cite the original St Petersburg rule, a distinction must nowadays be made between explosive anti-materiel projectiles and explosive anti-personnel projectiles. In particular, projectiles of the former type can be deemed no longer to be covered by the per se customary prohibition of certain explosive projectiles. The carve-out of an exception for the use of explosive anti-materiel projectiles – which remains, of course, governed by the general principles of the law of weaponry, such as the principle of distinction – finds some implicit support in national practice. Thus, the UK LOAC Pamphlet (1981) states that the law of armed conflict prohibits 'explosive or inflammable bullets for use against personnel', without extending the scope of this prohibition to anti-materiel projectiles.[41]

ANTI-MATERIEL PROJECTILES V ANTI-PERSONNEL PROJECTILES – DESIGN OR EFFECT?

The true Gordian knot then is to identify the precise boundary between explosive projectiles 'for use against personnel' and explosive 'anti-materiel' projectiles. In particular, the question arises whether this distinction hinges on the design of the projectile (that is, its intended use) or on its possible harmful effect.

Boothby, in his analysis of explosive bullets, puts considerable emphasis on the design element:[42]

> [W]eapons law rules are not based on the effects that a weapon may, on occasion, generate. Rather, weapons law considers the design purpose of the weapon, and how it is likely to perform in the intended circumstances of its use. This is an inherently more precise yardstick, which ties the weapons

Convention on Conventional Weapons (Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (1980 Protocol III), reprinted in Roberts and Guelff (eds) (n 12) 533, incendiary weapons do not include '[m]unitions designed to combine penetration, blast or fragmentation effects with an additional incendiary effect, such as armour-piercing projectiles, fragmentation shells, explosive bombs and similar combined-effect munitions in which the incendiary effect is not specifically designed to cause burn injury to persons, but to be used against military objectives, such as armoured vehicles, aircraft or facilities'.

[40] ICRC Study I (n 27) 272–73.

[41] ICRC Study II (n 31) 1789, para 19.

[42] Boothby (n 13) 143: 'Some weapons, including bullets, may sometimes perform in an unusual way and may cause unintended effects. Indeed, any piece of equipment is capable of developing a fault and, as a result, of failing to operate in its usual, designed, or intended manner. Equally, any piece of equipment that is misused, for example in breach of the manufacturer's instructions, will tend as a result to perform in a way which was not intended by the designer, sometimes but not necessarily with damaging consequences'.

> law rules more closely with the operational use for which the weapon has been produced and/or procured.

More importantly, the Raufoss controversy[43] lends support to a design-based, rather than an effects-based, approach. In 1998, following tests which had led it to conclude that certain 12.7 mm 'multi-purpose' rounds[44] exploded upon impact with human tissue stimulant,[45] the ICRC expressed reservations to the United States over the legality of so-called Raufoss ammunition. In 1999, it convened two expert meetings on the issue of 'bullets designed for anti-materiel purposes, but which detonate on impact with the human body'.[46] In the course of the meetings, the experts from the participating states expressed various objections to the ICRC's approach.[47] It was suggested, inter alia, that the ICRC was mistaken in following an 'effects-based' approach instead of focusing exclusively on the intended use of the multi-purpose rounds.[48] In 2001, the ICRC again raised the matter at the Second Review Conference of the Convention on the Use of Certain Conventional Weapons (CCW). The ICRC expressed its 'deep concern' about the proliferation of 12.7 mm multi-purpose bullets which had 'shown to frequently explode' within human tissue stimulants.[49] It suggested that this evolution 'undermined' the St Petersburg Declaration as well as the SIrUS prohibition and called on states to take measures against it.[50]

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[43] For an in-depth overview of the controversy (and a critical appraisal of the ICRC's approach), see W Hays Parks, 'Conventional Weapons and Weapons Reviews' (2005–8) Yearbook of International Humanitarian Law 57, 90.

[44] The 12.7 mm Raufoss round, developed by the Norwegian company Nammo Raufoss, is a (highly popular) multi-purpose projectile weighing circa 43.5 g with an armour-piercing, an explosive, and an incendiary component. It can be used to pierce and explode within lightly armoured targets as well as unarmoured vehicles, and is often used for sniper rifles. See, eg, Hays Parks, ibid 92–93.

[45] The ICRC tests (using glycerine soap blocks) were carried out at a time when the Raufoss rounds were already in service with military forces of several nations. The ICRC concluded that when hitting a human body, rather than penetrating the body and exiting on the other side without exploding, the 12.7 mm rounds would often detonate within the human body. If the person hit were to wear body armour, the detonation frequency would be even higher.

[46] The ICRC also expressed its concern over the production, sale and use of bullets capable of exploding on impact with a human body before the First Committee of the UN General Assembly in 1998 and 1999. See the quotes in ICRC Study II (n 31) 1793–94, paras 45–46.

[47] Thus, it was observed that the Raufoss rounds were not the only ammunition of its kind and, in fact, limited the likelihood of detonation in soft tissue in comparison to previous projectiles. The methodology and correctness of the ICRC's test was also put in doubt, inter alia, because of the short range (100 metres) used for the weapons test, which was said not to correspond with the weapon's intended usage, and because the tissue stimulant used was of greater density than human tissue: see Hays Parks (n 43) 92–95.

[48] According to Hays Parks, ibid 95, 'ICRC representatives and the participating experts in the two experts' meetings agreed that state practice following promulgation of the St Petersburg Declaration and continuing through the twentieth century had rendered its 400 gram limit obsolete. The government experts agreed with ICRC statements that a munition would be prohibited as constituting superfluous injury were it designed to detonate on impact with soft tissue, i.e., the human body'.

[49] ICRC, Statement by Dr Jakob Kellenberger at the 2nd Review Conference of the 1980 Convention on Certain Conventional Weapons, Geneva, 11 December 2001, http://www.icrc.org/eng/resources/documents/misc/57jrhq.htm.

[50] The '*dispositif*' of the report is reprinted in ICRC Study II (n 31) 1794, para 47). The report, inter alia,

> urged states which produce or transfer explosive projectiles under 400 grams which may explode within the human body urgently to (…) suspend the production and export of such projectiles until they have been

However, the concerns spelt out by the ICRC found no support among the states parties.[51] Norway explicitly declared that it considered the 12.7 mm rounds to be fully compliant with IHL. No state party declared otherwise. In particular, in a letter to the ICRC, Norway stressed the pivotal importance of the design element:[52]

> In the assessment of the legality of a particular weapon or kind of ammunition, there has been a clear practice among nations since 1868 of weighing the legality against the *intended use* of the weapon or ammunition. *In such assessments several factors, such as distance from the target, intended target categories and depth of penetration are considered to be relevant* when establishing the effect on the target.

In a similar vein, the United States has been keen to limit the scope of the per se prohibition to projectiles designed for anti-personnel use. Thus, in 2000 the Department of the Army stated that 'the considerable practice of nations during this century suggests that States accept that an exploding projectile designed exclusively for antipersonnel use would be prohibited, as there is no military purpose for it.[53] It may also be noted that the US has heavily criticised rule 78 of the ICRC Customary Study[54] (see Section 3.2 below for an analysis of rule 78) because the rule allegedly fails to distinguish between projectiles 'designed to explode in the human body', which the United States agreed were prohibited under customary law, and 'high-explosive

adapted so as to ensure that their use against combatants will not contravene the object and purpose of the St Petersburg Declaration. This would involve testing, redesign and other steps to ensure that the chance of the projectile's explosion within the human body (…) has been eliminated.

[51] Hays Parks (n 43) 96. Eventually, the Final Declaration adopted at the end of the Review Conference, far from supporting the measures proposed by the ICRC, merely 'took note' of the report submitted by the ICRC on the matter, while 'inviting' states to consider this report and take appropriate action. No further action was taken. At the Third Review Conference of the CCW Convention, the ICRC raised the matter again, albeit much more cautiously than in 2001:

> Repeated ballistic tests [confirm] that these 'multi-purpose' bullets can be expected to detonate in the human body under a variety of circumstances, including at short ranges and after striking body armour. We are aware that some States do not share the ICRC's ongoing concerns and that some have sponsored ballistic tests from which they have drawn different conclusions. We are not proposing further action by the Third Review Conference on this matter. Nonetheless, the ICRC invites States, whatever their views on the performance of the 'multipurpose' bullet in question, to confirm that they consider, as does the ICRC, that the anti-personnel use of bullets which explode within the human body is prohibited. We also urge States to integrate this rule in their military manuals and other training materials.

ICRC, Statement of Dr Philip Spoerri at the Third Review Conference on the Convention on Certain Conventional Weapons, Geneva, 7 November 2006, http://www.icrc.org/eng/resources/documents/statement/conventional-weapons-statement-071106.htm.

[52] Norway, Letter to the President of the ICRC, 11 May 2001, cited in ICRC Study II (n 31) 1791, para 32. (emphasis added).

[53] Quoted in ICRC Study II (n 31) 1791, para 35. Furthermore, at the Third Preparatory Committee for the CCW Review Conference in 2001, the US stated that it agreed with the ICRC 'that there is no valid military requirement for a bullet designed to explode upon impact with the human body': ibid 1792, para 36.

[54] ICRC Study I (n 27) 272–74. Rule 78 holds that '[t]he anti-personnel use of bullets which explode within the human body is prohibited'.

projectiles designed primarily for anti-materiel purposes'.[55] Furthermore, the British LOAC Manual of 2004 states that[56]

> [t]he practice of States indicates that the use of explosive or incendiary bullets designed solely for use against personnel is not permissible under customary law. The reason for this is because a solid round will achieve the military purpose of disabling the enemy combatant; if a round explodes on impact it would uselessly aggravate the injury.

In the end, it appears that, at least for purposes of the per se prohibition of certain explosive projectiles, the proper criterion for distinguishing between (as such permissible) explosive anti-materiel projectiles and (as such unlawful) explosive anti-personnel projectiles is in the design or 'intended use' of the projectile concerned.[57] As will be examined below, however, even if an explosive projectile is in principle designed for anti-materiel purposes, the SIrUS principle may nonetheless set important limits to its use (see Section 3).

XM25 AIRBURST ROUNDS

The question remains how does the erosion of the St Petersburg rule, elaborated above, influence the legality of the XM25 airburst rounds.

It is observed in this context that discussions and statements concerning the distinction between explosive anti-materiel projectiles and explosive anti-personnel projectiles (whether related to the Raufoss controversy or not) generally seem to concern *bullets* containing an explosive content that is 'impact-triggered', that is, set off by impact on the target. To simplify, the key criteria for determining whether such devices are designed for anti-materiel or anti-personnel purposes are (1) whether the explosive content is triggered by impact on a 'soft' target (such as human tissue) or only by impact on a 'hard' target (an armoured vehicle, for example), and (ii) how 'quickly' the impact on a target sets off the explosion.[58] Against this, the XM25 airburst rounds are neither designed to explode within the human body nor are they even *likely* to explode within the human body. The rounds are intended to explode in mid-air in the vicinity of human adversaries in defilade and to neutralise them by dispersing shrapnel.[59] While explosion within a human body cannot absolutely be ruled out – such an event may indeed occur when the programmed distance for explosion of the round corresponds exactly with the location of a

[55] Bellinger III and Haynes II (n 27) 460 ff.
[56] UK Ministry of Defence (n 21) 109.
[57] See, however, Secretary-General's Bulletin, Observance by United Nations Forces of International Humanitarian Law, UN Doc ST/SGB/1999/13, 6 August 1999, s 6.2, which prohibits, inter alia, the use of 'bullets which explode (…) in the human body'.
[58] If, because of the delay in ignition, the explosion only occurs 35 cm 'behind' the initial surface, this implies that, if the target were a human body, the explosion would take place after the projectile has left the human body.
[59] Rather, as explained above, the rounds contain a chip that allows them to track the distance travelled by calculating the number of spiral rotations they make around their axis after leaving the barrel. When the number of spiral rotations corresponds to the programmed distance-to-target, the round will explode.

human adversary that is not in defilade – this is not the *intended* use of the munition, nor would it seem *likely* to occur in practice.

Given the fundamentally different design, however, it appears that the criteria used to distinguish between anti-materiel and anti-personnel impact-triggered explosive projectiles cannot simply be transposed to non-impact-triggered (time-delayed or distance-delayed) explosive projectiles such as airburst rounds. Rather, in light of the description in Section 1, it is difficult to conceive of the XM25 high-explosive airburst rounds as anything other than explosive projectiles that are *intended/designed for anti-personnel use*. Contrary to multi-purpose rounds that are used to pierce an armoured vehicle and to explode within it (in which case the direct target is the armoured vehicle), the XM25 airburst rounds are not used to destroy the natural or artificial object behind which adversaries are hiding, but rather to neutralise enemies in defilade (in other words, the targets are individual adversaries).[60] In this sense, they undeniably qualify as anti-personnel explosive projectiles.

Still, it would be premature to conclude that the XM25 airburst rounds, being explosive projectiles below 400 g[61] and being *intended for anti-personnel use*, are automatically unlawful under customary international law. Such a conclusion would indeed go against a third evolution in state practice, which has further eroded the scope of the St Petersburg rule and which is described in the following section.

2.2.3 The Permissibility of Anti-Personnel Explosive Projectiles other than Impact-Triggered Bullets

Evolutions in state practice and opinio juris

Indeed, apart from the introduction of explosive anti-materiel bullets, state practice has also witnessed the widespread introduction of anti-personnel grenades weighing below 400 g. Such grenades already existed prior to the twentieth century, but have become more common in land warfare in the course of the First World War and beyond. The most obvious example concerns the time-delayed hand-thrown grenade. Other grenades are designed for use by grenade launchers and permit greater accuracy, higher velocity, and a longer target range.[62] Anti-personnel grenades can be either time-delayed, in which case a timing device will set off the explosion, or they can be impact-triggered. In the latter case, what distinguishes these devices from impact-triggered explosive *bullets* is that the bullets will usually follow a straight trajectory and are designed to explode on impact with the actual target (a light armoured vehicle, for example). By contrast, impact-triggered anti-personnel grenades (which usually follow a curved trajectory) are not designed specifically to explode on impact with a (hard or soft) target. Rather, they are designed

[60] See, however, n 10 above in relation to the development of armour-piercing ammunition for the XM25.
[61] n 28.
[62] Grenade launchers – which arguably fill the gap between hand grenades and mortars – can come in the form of stand-alone shoulder-fired weapons or attachments mounted under or above the barrel of a rifle. Some grenades are designed to be muzzle-fired. Heavier grenade launchers are typically mounted on vehicles or in emplaced positions.

to explode on ground impact, in the vicinity of enemy combatants, and to cause damage by fragmentation and/or blast.

While the employment of such projectiles – if less than 400 g – would at first sight appear to contravene the *acte clair* of the St Petersburg Declaration, their use in warfare has been widespread and has not been challenged (by either states or scholars). Indeed, even if this evolution appears not to have attracted any attention from legal scholars whatsoever, the ICRC Customary Study again confirms that 'lighter grenades … have been introduced [since the First World War]. [This development has] occurred without objection'.[63] On a closer look, it must be observed in this context that, while the legality of these projectiles is not directly addressed in most military manuals – other than through a general reference to the St Petersburg Declaration and/or the 400 g limit – some do distinguish between explosive 'bullets' on the one hand, and other explosive 'projectiles' (sometimes labelled as 'fragmentation weapons'), on the other. These manuals implicitly indicate that various types of grenade do not qualify as 'explosive bullets', but rather as 'other explosive projectiles' or 'fragmentation weapons'.[64] While 'explosive bullets' are covered by the analysis spelled out in the previous section, 'fragmentation weapons' are not. Thus, the UK LOAC Manual (2004) states in general terms that '[t]he general rule prohibiting the infliction of unnecessary suffering or superfluous injury does not preclude the use of hand-grenades and other fragmentation weapons'.[65] In a similar vein, the US Army's Field Manual 27-10 proclaims that the prohibition to use weapons causing 'unnecessary suffering' 'certainly does not extend to the use of explosives contained in artillery projectiles, mines, rockets or hand grenades'.[66] The implication seems to be that, while impact-triggered explosive bullets designed for anti-personnel purposes are unlawful per se, 'fragmentation weapons' are not normally as such unlawful – that is, as long as they respect the remaining rules and general principles of the law of armed conflict (such as the prohibition against non-detectable fragments,[67] the principle of distinction or the SIrUS rule).

Explosive bullets v explosive projectiles other than bullets – what criterion?

The foregoing raises the question of where should the line between 'explosive bullets' and 'fragmentation weapons' be drawn. Clearly, the introduction of various under-barrel grenade launchers has blurred the distinction between 'explosive bullets' and explosive projectiles *other than bullets*. The development of high-explosive airburst rounds for anti-personnel use further

[63] ICRC Study I (n 27) 273.
[64] A 1973 ICRC Report distinguishes between explosive and penetrating weapons. Penetrating weapons are said to cause injuries as a result of penetration of the human body by one or more missiles, such as projectiles or fragments. Explosive weapons may cause injury from blast and/or penetration of the human body: see ICRC, 'Weapons that May Cause Unnecessary Suffering or Have Indiscriminate Effects. Report on the Work of Experts', Geneva, 1973, paras 41 ff, http://www.loc.gov/rr/frd/Military_Law/pdf/RC-Weapons.pdf. However, this distinction is not particularly helpful for present purposes.
[65] UK Ministry of Defence (n 21) 110, para 6.1.1.
[66] US Department of the Army, Field Manual 27–10, 'The Law of Land Warfare', 1956, 18.
[67] cf Protocol I to the Convention on Conventional Weapons, 1980, reprinted in Roberts and Guelff (eds) (n 12) 527. See also UK Ministry of Defence (n 21) 110.

contributes to this evolution. For a proper understanding – and absent an established definition in treaty law or elsewhere – it is useful to go back to the *raison d'être* underlying the adoption of the St Petersburg Declaration. Thus, it appears that the inspiration for that document was the shared conviction of the states parties that explosive rifle bullets had no military advantage in comparison to normal rifle bullets that would warrant their increased lethality or the additional suffering caused, since regular bullets were sufficient to neutralise individual enemy combatants.[68] By contrast, the increased lethality/harmful effect of artillery shells was not only considered to be justified by their military advantage – that is, the fact that they could be used to overcome 'hard' targets such as fortified positions – but also because they can be used against infantry to 'eliminate a number of men at a stroke'.[69] Considering this rationale (based on the SIrUS principle) and taking stock of evolutions in state practice, it could be argued that the scope of the per se prohibition of certain explosive projectiles should be reduced to what one might label as 'single enemy' munition – which will in principle be far below the 400 g threshold – without extending to explosive projectiles used for anti-personnel purposes and which may, at least theoretically,[70] be used to neutralise multiple enemies at once.

Interestingly, there is at least one military manual that provides explicit support for this approach. According to the 1992 German Military Manual:[71]

> In the 1868 St Petersburg Declaration the use of explosive and incendiary projectiles under 400 grammes was prohibited, since these projectiles were deemed to cause disproportionately severe injury to soldiers, which is not necessary for putting them out of action. *This prohibition is only of limited importance now, since it is reduced by customary law to the use of explosive and incendiary projectiles of a weight significantly lower than 400 grammes which can disable only the individual directly concerned but not any other persons.* 20 mm high-explosive grenades and projectiles of a similar caliber are not prohibited.

This statement would seem to provide an accurate reflection of the per se prohibition in customary international law as it stands.[72] In conclusion then, all that remains of the old St Petersburg rule – in terms of prohibiting particular projectiles per se rather than outlawing specific uses of those projectiles – is an absolute ban on 'single enemy' infantry munitions designed to explode

[68] See, in this sense, Kalshoven (n 24) 205–08.
[69] ibid 208.
[70] As to the legality of the specific use of such weapon against an individual target, see Section 3.
[71] Federal Ministry of Defence of the Federal Republic of Germany, 'Humanitarian Law in Armed Conflicts – Manual', August 1992, rule 406, http://www.humanitaeres-voelkerrecht.de/ManualZDv15.2.pdf (emphasis added).
[72] See also Oeter (n 20) 137–38. Oeter explicitly relies on the rule spelt out in the German LOAC Manual. According to Oeter: 'The basic principle of the [St Petersburg Declaration] has … been transformed [letter/s missing] into customary law as a prohibition of explosive projectiles weighing under 400 g, but into a prohibition against infantry munitions with explosive or inflammable effects'. The present author believes this statement to be correct insofar as 'infantry munition' is understood as referring to 'single enemy' infantry munition.

According to ICRC Study I (n 27) 272–74, rule 78 applies as a norm of customary law both in international and in non-international armed conflicts. Boothby similarly concludes that the prohibition on the use of certain explosive bullets applies equally in international and non-international armed conflicts: see Boothby (n 13) 326. See, however, Bellinger III and Haynes II (n 27) 465.

on impact with the human body. In practice, these munitions will always remain far below the 400 g threshold, albeit that this threshold no longer seems to hold any legal relevance. In the end, there is considerable logic in this outcome. There would indeed seem to be no plausible reason why IHL would permit the anti-personnel use of high-explosive shells weighing over 400 g, while outlawing a similar grenade with a smaller explosive component and reduced impact weighing less than 400 g. As an old legal adagium has it: *qui peut le plus, peut le moins.*[73]

XM25 AIRBURST ROUNDS

Having considered the erosion of the original St Petersburg rule as a result of state practice, we can conclude that the use of the XM25 airburst rounds is not covered by the per se prohibition of certain explosive projectiles in customary international law. First, as indicated above, airburst rounds are not 'designed to' explode on impact with the human body. Second, they are not 'single enemy' munitions *stricto sensu* since they can be used to neutralise multiple enemies at the same time. In light of that, the conclusion must be that airburst rounds of the type used by the XM25 are a priori not incompatible with the law of armed conflict. Again, however, it must be stressed that the mere fact that an explosive projectile is not caught by what is left of the St Petersburg rule does not imply that its use is not subject to limitations under IHL. Clearly, other applicable rules and general principles of the law of armed conflict must still be complied with. Of key importance in this respect is the prohibition of unnecessary suffering.

3. LIMITATIONS ON THE *USE* OF CERTAIN EXPLOSIVE PROJECTILES FLOWING FROM THE PROHIBITION OF SUPERFLUOUS INJURY AND UNNECESSARY SUFFERING

3.1 GENERAL

Again, even if a certain weapon/projectile is not prohibited per se under treaty or customary international law, certain *uses* thereof may still be precluded as a result of the prohibition of 'unnecessary suffering' or '*maux superflus*' (or as a result of a specific customary or conventional rule finding its origin in the SIrUS principle).[74] Without restating the general analysis of the SIrUS principle (in Section 2.2.1), it may be recalled that the essential question in this context is whether the use of the weapon/projectile causes harm *greater than that unavoidable* to achieve legitimate military objectives. In order to determine whether this is the case, the weapon or projectile in question must be compared with alternative weapons/projectiles, in

[73] Translation: 'He who can do more, can do less'.

[74] Whether limitations on certain uses of a particular weapon find their legal basis directly in the SIrUS principle or in a specific customary or conventional rule based on the SIrUS principle is mostly an exercise in semantics. This is particularly the case with regard to limitations on the use of certain explosive projectiles, as both the SIrUS principle and the *lex specialis* norm concerning particular explosive projectiles (and which is an expression of the SIrUS principle) find their origin in the same document (ie the 1868 St Petersburg Declaration).

terms of both foreseeable injury or suffering and their efficiency in realising a (legitimate) military objective.[75]

The present section examines how this principle translates into the use of certain explosive projectiles. It first looks briefly at the use of explosive anti-materiel bullets and the use of explosive ammunition in aerial warfare, before examining the impact of the SIrUS principle on the use of the XM25.

3.2 Limitations on the Use of Explosive Anti-Materiel Bullets

First, as far as the use of impact-triggered explosive bullets is concerned, it is worth noting that rule 78 of the ICRC Customary Study states in general terms that '[t]he anti-personnel use of bullets which explode within the human body is prohibited'.[76] The implication is that, in the view of the ICRC, customary international law not only prohibits explosive bullets *designed* for anti-personnel uses (cf above), but also excludes the *anti-personnel use* of bullets the foreseeable *effect*[77] of which is to explode on impact with a human body (even if designed for anti-materiel purposes).[78]

The ICRC position was harshly criticised by the United States, which objected that it was not supported by state practice.[79] It is observed, however, that while the US Commentary to the Study argues that there has been considerable state practice involving the anti-personnel use of exploding bullets, it fails to make a convincing case in this respect. The US Commentary essentially confines itself to criticising the limited amount of customary evidence put forward in the ICRC Study, without itself adducing positive evidence (in practice, let alone *opinio*) supporting the legality of the anti-personnel use of bullets which have the effect of exploding within the human body. This is all the more remarkable when considering that, in a 1998 legal review of the 12.7 mm explosive bullets, the US Department of the Army itself explicitly stated that 'a projectile that will explode on impact with the human body would be prohibited by the law of war

[75] See, eg, Dinstein (n 16) 65.
[76] ICRC Study I (n 27) 272.
[77] According to Boothby, it is inappropriate to refer to 'foreseeability' as the criterion in this weapons law context. Boothby instead proposes to focus on the 'usual or normal effect' of the weapon, since relatively rare and unintended behaviour could in theory be described as 'foreseeable': see Boothby (n 13) 144.
[78] In a similar vein, see the statement of the ICRC at the Third Review Conference of the CCW, quoted at n 51.
[79] Bellinger III and Haynes II (n 27) 460 ff. The US Commentary implicitly interprets rule 78 as proclaiming a general per se prohibition not only of explosive bullets designed for anti-personnel purposes (ibid 461), but also of explosive bullets that have the effect of exploding on impact with the human body (even if designed for anti-materiel purposes). While one may share sympathy with the US criticism of the lack of analytical clarity in the ICRC's position in that rule 78 fails to properly distinguish between the 'design' scenario and the 'effect' scenario, the US interpretation does not appear to properly reflect the scope of rule 78. Indeed, the better view is that rule 78 merely proscribes the anti-personnel (as opposed to anti-materiel) use of projectiles that have the effect of exploding on impact with the human body (but which are not designed for anti-personnel use), without subjecting them to a per se prohibition. Elsewhere in the ICRC Study, the distinction between the two scenarios is effectively mentioned: 'The military manuals or statements of several States consider only the anti-personnel use of such projectiles to be prohibited or only if they are designed to explode upon impact with the human body': ICRC Study I (n 27) 273.

from use for anti-personnel purposes.[80] Furthermore, the summary report of one of the 1999 expert meetings set up by the ICRC over the legality of the 12.7 mm multi-purpose rounds – and which was reviewed and accepted by all participants[81] – not only confirms that '[t]here is no military requirement for a projectile designed to explode upon impact with the human body', but also states the following:[82]

> The prohibition on the intentional use against combatants of such projectiles which explode upon impact with the human body, which originated in the 1868 St Petersburg Declaration, continues to be valid. The targeting of combatants with such projectiles the foreseeable effect of which is to explode upon impact with the human body would be contrary to the object and anti-personnel use of bullets purpose of the St Petersburg Declaration.

It may, moreover, be noted in this context that the (non-binding) 2009 HPCR Manual on Air and Missile Warfare states that weapons prohibited in air or missile combat operations include 'small arms projectiles *calculated, or of a nature*, to cause explosion on impact with or within the human body'.[83]

Contrary to the current US position, this author is inclined to agree that the SIrUS principle normally bans the *anti-personnel use* of projectiles the effect of which is to explode on impact with or within a human body (even if not designed for this purpose). Practical and operational considerations may nonetheless warrant exceptions to this principle, for example, when a person has no alternative ammunition or has no opportunity, given the circumstances, to switch ammunition. It is worth noting in this respect that the Norwegian position (at Section 2.1.2 above) is that 12.7 mm multi-purpose rounds should not be used against personnel, but only for anti-vehicle/anti-tank purposes. Although insisting that this is a matter of policy rather than of law, Norway holds that 12.7 mm multi-purpose ammunition can be used for anti-personnel purposes only 'as a means of self-defence' 'when a combatant is empty of all other ammunition'. Furthermore, the British LOAC Manual of 2004 emphasises that IHL does not prevent 'the use of explosive or combined-effects munitions (…) for defeating material targets, even though personnel may be incidentally wounded by them'.[84] The Manual further states that it is 'lawful … for snipers to use combined-effects munitions against either materiel or personnel targets'. While

[80] Quoted in ICRC Study II (n 31) 1791, para 35 ('This remains the view of the US'). The broad phrasing ('that will explode') would seem to cover both projectiles 'calculated to' or 'designed to' explode on impact with the human body as well as projectiles 'of a nature to' (or 'the foreseeable effect of which is to') explode on impact with the human body.
[81] ibid 1792, para 40.
[82] Reprinted in ICRC Study II, ibid 1792, para 40.
[83] HPCR, *Manual on International Law Applicable to Air and Missile Warfare*, Bern, 15 May 2009, rule 6(e), http://ihlresearch.org/amw/HPCR%20Manual.pdf (emphasis added). At first sight, the rule would appear to exclude both the anti-materiel and the anti-personnel use of such projectiles, thus boiling down to a per se prohibition (and, in fact, going beyond the scope of rule 78 of ICRC Study I). The HPCR Commentary nonetheless clarifies that 'the prohibition does not affect the use of projectiles against inanimate objects, including aircraft': see HPCR, *Commentary on the HPCR Manual* (n 33) 7.
[84] UK Ministry of Defence (n 21) 109.

the UK Manual does not explicitly say so, a possible interpretation of the cited paragraphs – when read together – is that the anti-personnel use of combined-effects munitions which explode on impact with the human body is deemed to be permissible only on the part of snipers. The special position of snipers would apparently relate to the practical difficulty for snipers to change the type of ammunition used when switching between hard and soft targets. At the same time, while practical and operational considerations may exceptionally justify the *anti-personnel use* of projectiles the effect of which is to explode on impact with or within a human body (but which are not designed for this purpose), there may in such cases still be questions as to whether those who decided upon and planned the operation have taken the necessary precautions in the choice of means of warfare. It would thus be unlawful to equip military forces with explosive projectiles that will usually or normally explode on impact with the human body in circumstances when it is foreseeable that they will consequently have no alternative but to make (otherwise avoidable) use of such weapons against persons.

3.3 Limitations on the Use of Explosive Ammunition in Aerial Warfare

In Section 2.2.1, it was explained that state practice has removed the use of explosive ammunition in aerial warfare from the scope of the per se prohibition of certain explosive projectiles. The categorical phrasing of Article 18 of the (non-binding) 1923 Hague Rules of Air Warfare, without further target restrictions, has led some to argue that aircraft may use explosive bullets both for anti-materiel and anti-personnel use.[85] However, the UK Military Manual would seem to suggest that the use of such ammunition is lawful provided that it is directed solely against inanimate military targets (including aircraft), but becomes unlawful 'if directed solely against combatant personnel'.[86] For a proper understanding of the aerial warfare exception, it is useful to have a closer look at the commentary of the Commission of Jurists that drew up the Hague Rules. In relation to Article 18, the commentary indeed stresses 'the impracticability for an airman while in flight to change the ammunition which he is using in the machine-gun in his aircraft'.[87] Reminiscent of this rationale, the (non-binding) 2009 HPCR Manual on Air and Missile Warfare observes that some modern aircraft (including helicopters) may be capable of transporting personnel who could change ammunition in mid-air.[88] If so, the Manual continues, it is arguable that the original provision of the 1868 St Petersburg Declaration ought to remain intact.

[85] See, eg, implicitly Bellinger III and Haynes II (n 27) 463: 'Although the [ICRC Customary] Study refers to the [Hague Draft Rules of Air Warfare], it does not note that this exception to the total ban on use of exploding bullets permits their use by aircraft without categorical target restrictions, i.e., permits such use for anti-matériel or anti-personnel use'.

[86] See ICRC Study II (n 31) 1789, para 18.

[87] Commission of Jurists, General Report, reprinted in (1938) 32 American Journal of International Law Supp 1, 20–21: 'He cannot employ different bullets in accordance with the target at which he is aiming, one sort of ammunition for other aircraft and another sort for land forces by whom he may be attacked. The Commission, therefore, came to the conclusion that the most satisfactory solution of the problem would be to state specifically that the use of tracer, incendiary or explosive projectiles by or against aircraft is not prohibited'.

[88] HPCR, *Commentary on the HPCR Manual* (n 33) 72.

3.4 LIMITATIONS ON THE USE OF XM25 AIRBURST ROUNDS?

Could one conceive of situations in which the anti-personnel use of airburst rounds would run against the prohibition of unnecessary suffering? When used against hostiles in defilade, this would normally not seem to be the case, since the suffering caused by the employment of airburst rounds is, in such a scenario, prima facie justified by the military advantage – that is, there is no alternative that would bring about the same result while causing less harm; the harm would thus not be 'unavoidable' in the sense of the SIrUS rule. What about the anti-personnel use of airburst rounds against hostiles *not* in defilade, and who could accordingly be eliminated by means of regular (non-explosive) infantry ammunitions which follow a straight trajectory?

To answer this question, a distinction could be made between the use of airburst rounds against multiple adversaries and their use against a single (unconcealed) human target. In the former hypothesis, the use of airburst rounds would not seem to be unlawful in light of the capability of airburst rounds (as opposed to regular infantry ammunitions) to eliminate 'several men at a stroke'. This clear-cut military advantage is not present when airburst rounds are used against a single (unconcealed) human target. Does this imply that their use is excluded in the latter scenario? On the one hand, the effect of airburst rounds when used against a single and unconcealed human target may be akin to that of impact-triggered explosive bullets (in particular when the timing for detonation corresponds to the actual distance-to-target). They could cause far greater harm (and be far more lethal) than normal (non-explosive) infantry ammunition,[89] while the use of regular non-explosive bullets could, in principle, suffice to eliminate the target. On the other hand, one should be wary of excluding the use of a given weapon on the basis of 'false sentiments of humanity'.[90] Various operational considerations may indeed justify the increased lethality of airburst rounds. This may be true not just in respect of the anti-personnel use of airburst rounds by snipers or by a combatant who has run out of other ammunition (discussed above). One should indeed not forget that the design of airburst rounds is rather comparable with that of hand grenades and various projectiles used with grenade-launchers. In this context, it must be observed that the increased lethality of airburst rounds may in a sense be 'cancelled out' by their increased hit probability (in comparison to regular infantry ammunitions) and the reduced risk to soldiers using them. This military advantage – that is, the increased certainty that the adversary is rendered *hors de combat* (without requiring a 'perfect hit') – could suggest that the use of airburst rounds will, in most contexts – even when used against enemies not in defilade – not contravene the prohibition of unnecessary suffering.

Still, the deliberate use of airburst rounds against a single and unconcealed enemy could – depending on a variety of factors including, but not limited to, the distance-to-target and the availability of alternative weapon systems – exceptionally be objectionable from the viewpoint of the prohibition of unnecessary suffering. On a related note, by analogy with what was said

[89] Other things being equal, it may be said that casualties from fragmentation weapons are more likely to die than casualties from other types of conventional weapon: see 1973 ICRC Report (n 64), paras 147–51.
[90] cf Kalshoven (n 24) 211.

in Section 3.2 in respect of explosive bullets, it may be argued that, as a precautionary measure, military units using the XM25 should also be equipped with less harmful alternatives.

A final question in this context pertains to the impact on the discussion of the development of 'non-lethal' alternatives. Indeed, Alliant Techsystems, the manufacturer of the XM25, has indicated that the rifle may later use bullets with a smaller explosive charge which will stun opponents rather than kill them.[91] Other manufacturers may similarly be in the process of developing 'non-lethal' or 'less-than-lethal' airburst rounds.[92]

It is recalled in this respect that the prohibition of causing unnecessary suffering presupposes a balancing test between two fundamental principles: notably the principle of humanity and the principle of military necessity. The former principle was famously interpreted by Jean Pictet as meaning that capture is preferable to wounding an enemy and wounding is better than killing him; that wounds inflicted should be as light as possible and should cause the least possible pain.[93] Insofar as 'non-lethal' or 'less-than-lethal' projectiles are, in a given context, sufficient to secure the neutralisation of the adversary, this begs the question of what 'military necessity' would justify the deployment of their lethal equivalents.

Interestingly, the ICRC's *Interpretive Guidance on the Notion of Direct Participation in Hostilities* suggests that 'while operating forces can hardly be required to take additional risks for themselves or the civilian population in order to capture an armed adversary alive, it would defy basic notions of humanity to kill an adversary or to refrain from giving him or her an opportunity to surrender where there manifestly is no necessity for the use of lethal force'.[94] It should, however, be noted that this was one of the most controversial statements of the Interpretive Guidance,[95] and that the ICRC itself suggests that it is particularly relevant 'where a party to the conflict exercises effective territorial control, most notably in occupied territories and non-international armed conflicts', but implicitly admits that this may be less so in

[91] The less-than-lethal airburst variant was reported to be a smaller version of the 'flash bang' stun grenades popular with special operations and police SWAT teams in hostage situations: see ATK, 'XM25 Counter Defilade Target Engagement System' (May 2009), http://www.atk.com/capabilities_space/documents/sw_iw_xm25.pdf. 'U.S. Army Envisions an XM-25 Smart Gunner in Every Squad from 2014' *Homeland Security News Wire*, (13 December 2010), http://www.homelandsecuritynewswire.com/us-army-envisions-xm-25-smart-gunner-every-squad-2014.

[92] The term 'non-lethal' is sometimes criticised since even so-called 'non-lethal weapons', such as rubber bullets, can and do cause fatalities in certain situations. Thus, even if these weapons generally minimise fatalities, the danger of fatal injury generally remains: see, eg, Boothby (n 13) 246–47. The UK LOAC Manual (2004) defines non-lethal weapons as 'weapons that are explicitly designed and developed to incapacitate or repel personnel, with a low probability of fatality or permanent injury, or to disable equipment, with minimal undesired damage or impact to the environment': UK Ministry of Defence (n 21) 118. See also David A Koplow, *Death by Moderation. The U.S. Military's Quest for Useable Weapons* (Cambridge University Press 2010) 203–05.

[93] Jean Pictet, *Humanitarian Law and the Protection of War Victims* (Sijthoff 1975) 32. This is the so-called 'Pictet continuum'.

[94] ICRC, *Interpretive Guidance on the Notion of Direct Participation in Hostilities under International Humanitarian* Law (International Committee of the Red Cross 2009) 82.

[95] See, eg, the critique of Hays Parks and the reply in Nils Melzer, 'Keeping the Balance Between Military Necessity and Humanity: A Response to Four Critiques of the ICRC's Interpretive Guidance on the Notion of Direct Participation in Hostilities' (2010) 42 New York University Journal of International Law and Politics 83.1.

classic battlefield situations involving large-scale confrontations.[96] NATO's Policy on Non-Lethal Weapons stresses[97] for its part that

> [n]either the existence, the presence nor the potential effect of Non-Lethal Weapons shall constitute an obligation to use Non-Lethal Weapons, or impose a higher standard for, or additional restrictions on, the use of lethal force. In all cases NATO forces shall retain the option for immediate use of lethal weapons consistent with applicable national and international law and approved Rules of Engagement.

In any event, the debate concerning the impact of non-lethal alternatives on the application of the SIrUS principle is obviously not limited to individual airburst weapon systems, but has a much wider scope. In light of that, an in-depth discussion of the controversy (which is partially inspired also by considerations of international human rights law) falls beyond the ambit of the present contribution. It suffices to note that the development of 'non-lethal' or 'less-than-lethal' airburst rounds is one among several technological developments that are making the controversy increasingly acute.

4. THE PRINCIPLE OF DISCRIMINATION AND THE PROPORTIONALITY PRINCIPLE

4.1 GENERAL

For the sake of completeness, it is observed that, even if a certain weapon/projectile is not subject to a specific prohibition in treaty or customary law, and even if it does not normally appear to contravene the SIrUS rule, this is not the end of the matter. Indeed, the deployment of such weapon/projectile will, in any event, remain subject to a multitude of other rules of LOAC – whether of a specific or a general nature. Without going into the rules on targeting (set out primarily in Articles 48 to 60 of Additional Protocol I), including the duty to take certain precautions in attack (see, for example, Article 57) – which are beyond the scope of our analysis – the present section briefly pauses at the relevance of the principle of discrimination and the proportionality principle.

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[96] ICRC (n 94) 78–82. The document acknowledges that '[d]uring the expert meetings, it was generally recognized that the approach proposed by Pictet is unlikely to be operable in classic battlefield situations involving large-scale confrontations … and that armed forces operating in situations of armed conflict, even if equipped with sophisticated weaponry and means of observation, may not always have the means or opportunity to capture rather than kill' (82, fn 221; see also 78, fn 212). For this reason, the use of non-lethal weapons is thought to be 'particularly relevant where a party to the conflict exercises effective territorial control, most notably in occupied territories and non-international armed conflicts' (81). The document acknowledges that '[i]n classic large-scale confrontations between well-equipped and organized armed forces or groups, the principles of military necessity and of humanity are unlikely to restrict the use of force against legitimate military targets beyond what is already required by specific provisions of IHL'.

[97] NATO Policy on Non-Lethal Weapons, 1999, RTO-TR-SAS-040, Annex B, B-1, http://ftp.rta.nato.int/public//PubFullText/RTO/TR/RTO-TR-SAS-040///TR-SAS-040-ANN-B.pdf. The UK LOAC Manual (2004) states that '[g]enerally speaking, devices that temporarily incapacitate combatants … are, from the lethal point of view, to be preferred to lethal weapons or those that cause permanent harm to individuals': UK Ministry of Defence (n 21) 118.

The former principle is a direct outflow from, and further operationalises, the quintessential principle of distinction, which requires parties to an armed conflict to distinguish at all times between civilian objectives and military objectives. It is expressed in clear terms in Article 51(4) of Additional Protocol I:

> Indiscriminate attacks are prohibited. Indiscriminate attacks are:
> (a) those which are not directed at a specific military objective;
> (b) those which employ a method or means of combat which cannot be directed at a specific military objective;
> (c) those which employ a method or means of combat the effects of which cannot be limited as required by this Protocol;
> and consequently, in each such case, are of a nature to strike military objectives and civilian objectives without distinction.

Sub-paragraph (a) of Article 51(4) has no direct bearing on the legality of a specific weapon as such, but is instead concerned with the specific manner in which a particular attack is directed.[98] It prohibits attacks carried out in such a (nonchalant) manner that the attacker, while not seeking to directly target civilians, is unable to know (or simply does not care) whether his attack will end up injuring, or causing the death of, civilians.[99] Subparagraphs (b) and (c), on the other hand, essentially prohibit a belligerent party from using weapons the effects of which it cannot control, and which are for this reason intrinsically incapable of distinguishing between civilian and military targets. A leading example is a long-range missile with a built-in faulty guidance system, making it impossible to aim the weapon at a specific point.[100] Biological weapons for which no antidote exists could also be regarded as inherently indiscriminate weapons.[101]

The proportionality principle, in turn, is codified in Article 51(5)(b) of Additional Protocol I, which forbids attacks 'which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated'. By analogy with Article 51(4)(a) of Additional Protocol I, Article 51(5)(b) does not affect the intrinsic legality of a particular weapon or projectile, but merely sets limits to its use. The difference between the two provisions lies in the fact that the proportionality principle forbids attacks that are directed against a specific military objective, but in such circumstances that the expected 'collateral damage' (that is, harm to civilians, loss of civilian life and/or damage to civilian objects) will outweigh the military advantage expected from the attack.

[98] See Boothby (n 13) 78.
[99] Dinstein (n 16) 127–28.
[100] Michael N Schmitt, 'Future War and the Principle of Discrimination' (1998) 28 Israel Yearbook on Human Rights 51, 55.
[101] ibid.

4.2 XM25 AIRBURST ROUNDS

Without engaging in an in-depth analysis of the scope and legal underpinning of the two principles,[102] the question arises as to what extent they impact on the deployment of XM25 airburst rounds. A first (and obvious) thing to note in this context is that, taking into account the features of the XM25, it is clear that it is not inherently indiscriminate in the sense of Article 51(4)(b)–(c) of Additional Protocol I. Quite the contrary, as explained in Section 1, the XM25's 'Target Acquisition/Fire Control' mechanism allows the person handling the weapon to accurately detect and determine range to targets, and to programme the 25 mm rounds to detonate in mid-air at the programmed distance. As a result, it is perfectly possible to use the weapon in such a way that it causes no indiscriminate effects.

This being said, it is equally clear that the XM25 can potentially be used in such a way as to violate the prohibition of indiscriminate attacks, or the proportionality principle. Thus, if one were to fire XM25 airburst rounds 'blindly' – that is, without a clear idea of the nature of the target – into a territory controlled by the enemy, such conduct would arguably infringe Article 51(4)(a) of Additional Protocol I.[103] Furthermore, if one were to use XM25 airburst rounds to eliminate an enemy combatant hiding behind a wall, in full knowledge that such action might cause harm or even death to multiple innocent bystanders[104] located in the vicinity of the target, this could amount to a violation of the proportionality principle.

While such unlawful use of the XM25 is not a priori excluded, it must nonetheless be emphasised that the sophisticated technology supporting the XM25 airburst rounds appears to make it more accurate than some of the existing alternatives (for example, mortars or rifle-mounted grenade launchers) that are sometimes used against hostiles in defilade. If anything, therefore, the projectiles are likely to make it more, not less, likely to comply with the principle of discrimination. In a similar vein, XM25 airburst rounds have a lower destructive impact than some of the alternative weapons, such as artillery or air strikes, that are sometimes used against enemy combatants hiding behind walls or in ditches. The implication is that the weapon may make it possible to reduce the amount of 'collateral damage' when targeting a given military objective. In sum, seen from the perspective of the principle of discrimination and the proportionality principle, the introduction of the XM25 airburst rounds is not necessarily an unwelcome development (even if it could perhaps lead belligerent parties to show less reserve in deciding to engage military objectives with a significant civilian presence).

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[102] See, eg, APV Rogers, 'The Principle of Proportionality' in HM Hensel (ed), *The Legitimate Use of Military Force* (Ashgate 2007) 189; Friedhelm Krüger-Sprengel, 'Le concept de proportionalité dans le droit de la guerre' (1980) 19 Revue de Droit Militaire et de Droit de la Guerre 177; Frits Kalshoven, 'Implementing Limitations on the Use of Force: The Doctrine of Proportionality and Necessity' (1992) 86 American Society of International Law Proceedings 39; Michael N Schmitt, 'The Principle of Discrimination in 21st Century Warfare' (1999) 2 Yale Human Rights and Development Law Journal 143.

[103] cf Dinstein (n 16) 127.

[104] Leaving aside the discussion on (voluntary or involuntary) human shields.

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5. CONCLUDING OBSERVATIONS

Individual airburst weapon systems such as the XM25 make it possible to engage hostiles in defilade without the need for exposure, thus endowing them with a clear strategic usefulness in land warfare (in particular, in guerrilla warfare). They also potentially reduce the need to have recourse to more destructive weaponry (such as artillery), may permit for greater accuracy than certain alternative weapons, and could thus result in a lower risk of collateral damage and better compliance with the principle of discrimination. Individual airburst weapon systems are being developed by a substantial number of weapons manufacturers and are likely to be introduced into the military forces of various states. In light of the foregoing, they could well turn out to be a 'game changer' on the battlefield.

As for the law on the battlefield, however, individual airburst weapon systems hardly qualify as a revolution, as a radical departure from the existing normative framework concerning explosive projectiles. Rather, they form part of a continuous evolution, whereby changes in military technology and the introduction of various new types of what can generically be labelled 'explosive projectiles' give way to an adjustment – and in some respects erosion – of the normative framework. In other words, from a legal perspective, the introduction of individual airburst weapon systems does not constitute a 'game changer', but is rather symptomatic of the difficulties inherent in the normative framework concerning explosive bullets and other small arms ammunitions. A number of concluding observations can be made in this context.

First, even if the St Petersburg rule – which outlawed 'projectiles of a weight below 400 grammes, which are either explosive or charged with fulminating or inflammable substances' – is still cited in numerous military manuals, state battlefield practice has strongly eroded the scope of the original prohibition. Indeed, all that remains of the old St Petersburg rule – in terms of prohibiting particular projectiles per se, rather than specific uses of those projectiles – is an absolute ban under customary international law on 'single enemy' infantry munitions *designed to* explode on impact with the human body. When tested against this standard, it must be recognised that individual airburst weapon systems are not unlawful as such: airburst rounds are not designed to explode on impact with the human body; nor do they fit within the category of 'single enemy' anti-personnel bullets. In addition, given their military utility, the (anti-personnel) use of airburst rounds will in most contexts – even when used against enemies not in defilade – not contravene the prohibition of causing unnecessary suffering (although military units ought to be equipped, as a precautionary measure, with less harmful alternatives).

Second, the erosion of the St Petersburg rule pursuant to changes in state practice has gone remarkably unnoticed. While technological evolutions relating to small arms have shaped – and continue to shape – the face of land warfare, these evolutions have scarcely received any attention from legal scholars at all, irrespective of the fact that some of these developments would seem prima facie to be incompatible with the original St Petersburg rule.[105] One of the reasons for

[105] Thus, many IHL handbooks simply restate the content of the St Petersburg Declaration without further ado: eg, Robert Kolb, *Ius in Bello. Le droit des conflits armés* (2nd edn, Bruylant 2009) 297. David even seems to negate the erosion of the St Petersburg Declaration through subsequent customary practice: see Eric David, *Principes de*

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this may be a lack of familiarity with the functioning of various weapon systems. Indeed, as Hays Parks – one of the rare experts to have written extensively on the legality of ammunition under IHL – cautions, a legal review generally requires more than a cursory knowledge of treaty history, but presupposes a sound knowledge of the history of weapons development and employment, of the functioning of weapons and/or munitions and of wound ballistics methodology.[106] At the same time, more frequent and widespread scrutiny of ammunitions by legal scholars, even by those who – like the present author – are not at all ballistics experts, would be a welcome development. Greater involvement of international lawyers in the realm of small arms and ammunitions could contribute to clarifying the normative framework and posing critical questions in respect of weaponry that sit uneasily with the fundamental principles of customary IHL.

The erosion of the St Petersburg rule has also, by and large, been ignored by the states themselves. Most military manuals do not properly reflect customary international law as it stands. Some manuals restate a prohibition of explosive 'bullets' without paying attention to the difference between bullets designed for anti-materiel use or for anti-personnel use. Others still refer to a general prohibition of 'explosive *projectiles*' along the 400 g threshold, thus ignoring that a wide array of (commonly used) grenades would be caught by such a rule. It is clear that this is an aspect where most of these documents are in need of revision. Otherwise, it may be that in those countries that perform a so-called 'Article 36 review',[107] legal advisers occasionally examine the compatibility with IHL of new small arms and ammunitions. On occasion, a specific small arm or type of ammunition may effectively be found to be unlawful per se, or may be deemed to be lawful only subject to modifications in its design or certain restrictions in its use. The fact remains, however, that these reviews consistently take place behind closed doors and their outcomes inevitably remain confidential (and cannot therefore contribute to the formation or further refining of customary law).

A fourth and final observation, then, is that customary practice has replaced a rather clear-cut and workable rule – the St Petersburg 400 g threshold – by a far less transparent normative framework, making it much harder to verify, let alone enforce, compliance. Indeed, to simplify, while one might say that, at the end of the nineteenth century, nothing more than a weighing scale was needed to assess compliance with the rule, the modern-day normative framework

droit des conflits armés (4th edn, Bruylant 2008) 372–73 ('*ce n'est pas parce qu'il existe une pratique contraire à une règle qu'il en découle nécessairement une nouvelle règle coutumière*': 'it's not because there exists a practice that is contrary to a rule that this necessarily gives rise to a new customary rule'). For some examples of articles focusing on the legality of (specific types of) small arms ammunitions under the law of armed conflict, see, eg, Mark G Granat, 'Modern Small-Arms Ammunition in International Law' (1993) 40 Netherlands International Law Review 149; W Hays Parks, 'Means and Methods of Warfare' (2006) 38 George Washington International Law Review 511; Robin Coupland and Dominique Loye, 'The 1899 Hague Declaration Concerning Expanding Bullets. A Treaty Effective for More than 100 Years Faces Complex Contemporary Issues' (2003) 849 International Review of the Red Cross 135.

[106] Hays Parks (n 43) 100–01. See also, in relation to expanding bullets, Coupland and Loye, ibid.

[107] According to art 36 of Additional Protocol 1 (n 15): 'In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.'

regarding explosive projectiles requires complex weapons tests with human tissue simulant and a careful examination of a weapon's design (including kinetic energy released, velocity, shape, trajectory after impact, …). Moreover, these analyses may well lead to diverging interpretations. Indeed, as is illustrated by the Raufoss saga (at Section 2.2.2 above) and, in particular, the disagreement over the accuracy of the weapons tests conducted by the ICRC,[108] there are not always straightforward answers in respect of the legality under IHL of specific projectiles. In addition, the sobering experience of the ICRC in relation to the Raufoss controversy may have reduced its willingness to question the legality of other small arms and ammunitions in the future.[109]

If legal experts are increasingly likely to disagree – because of the reduced determinacy of the normative framework – how difficult has it now become to monitor and enforce compliance on the battlefield? Put simply, when a specific weapon is prohibited per se (under a specific rule of the framework applicable to the legality of weapons), armed forces on the battlefield will normally not be confronted with complex questions of legality (since the weapon should not be part of their equipment). By contrast, when the weapon is itself not unlawful, but its use may nonetheless contravene the prohibition of unnecessary suffering under certain circumstances, it ultimately befalls the individual soldier to decide (often in the heat of combat) whether or not to deploy a certain weapon, and to balance the available options. In such a scenario, ensuring compliance with the basic principles of IHL is far from obvious.

This is all the more so if the legal framework is not sufficiently clear and no operational instructions are given to those on the ground. As the cliché goes: 'To a man with a hammer, everything looks like a nail'. Recent experience concerning the XM25 seems to confirm this. Indeed, US troops who were asked to try out the XM25 in Afghanistan reportedly began to use it 'as their primary weapon', 'foregoing additional weapons' such as the M4 assault rifle.[110] By analogy, absent workable and transparent operational rules, it is plainly absurd to expect combatants to use non-lethal weapons (outside a law enforcement context) rather than their lethal equivalents; or to refrain from anti-personnel use of combined-effects ammunition that may explode on impact with human tissue.

Against this background, the main lesson to be drawn from the introduction of individual airburst weapon systems in land warfare – even if those weapons are not as such unlawful – may be that the normative framework regarding explosive bullets, and regarding small arms ammunition

[108] n 47.

[109] On a general note, it may be said that the legality of small arms ammunition is a field which the ICRC has found difficult to enter. Ever since this topic appeared on the ICRC's radar (in the wake of the Vietnam War), it has struggled to overcome states' reluctance to put this on the international agenda. This is reflected not only in the Raufoss saga (cf Hays Parks (n 43)), but also in the criticism in respect of the ICRC's 1973 report on weapons that may cause unnecessary suffering (n 64) (cf Hays Parks (n 105) 515) as well as the premature conclusion of the ICRC's SIrUS project (see, eg, Boothby (n 13) 65–66). One might add that the ICRC has also adopted a guide on the review of new weapons in accordance with art 36 of Additional Protocol I (ICRC, 'A Guide to the Legal Review of New Weapons, Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1997' (January 2006, revised November 2006, 13–14 and 16), http://www.icrc.org/eng/resources/documents/publication/p0902.htm. Unfortunately, however, today most states, whether party to Additional Protocol I or not, still lack such a mechanism for the legal review of new weapons, means or methods of warfare.

[110] Lopez (n 6).

more generally, is in need of clarification. Existing treaty law regarding small arms ammunitions – which can be summed up in three sentences: one drafted in 1868 (regarding explosive projectiles), a second one drafted in 1899 (the prohibition of expanding bullets), and the third drafted in 1980 (regarding non-detectable fragments) – is outdated and does not do justice to the strongly diverging features of different types of ammunition. In light of this, the time seems ripe for a renewed focus on the extent to which the use in different circumstances of various types of small arms ammunition is compatible with the rules of IHL, in particular with the prohibition of unnecessary suffering, and to translate this into operationally workable rules.

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