

**Invisible Soldiers:
The Perfidy Implications of Invisibility Technology
in Battlefields of the Future**

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Exeter Centre for International Law

Working Paper Series

2018/7

Exeter Centre for International Law

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Cite as Sephora Sultana & Hitoshi Nasu, "Invisible Soldiers: The Perfidy Implications of Invisibility Technology in Battlefields of the Future", ECIL Working Paper 2018/7.

INVISIBLE SOLDIERS:
THE PERFIDY IMPLICATIONS OF INVISIBILITY TECHNOLOGY IN BATTLEFIELDS OF
THE FUTURE

Sephora Sultana^{1*} and *Hitoshi Nasu*^{2**}

I. INTRODUCTION

Invisibility technology will provide soldiers and military equipment with the ultimate form of protection without restraint upon mobility and manoeuvrability. While the idea has long been considered a fantastical one, recent technological advances edge closer toward the development of invisibility technology and its deployment on battlefields of the future. This prospective development necessitates careful consideration of how the existing laws of armed conflict (LOAC) should be interpreted and applied to the use of invisibility technology in warfare. It raises a variety of LOAC-related issues to consider—for example, in respect of weapons review, the principle of distinction and proportionality assessments.³

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³ For a useful overview of these issues, see Kaitlin J. Sahni, *The Legality of Invisibility Technology in Modern Warfare*, 103 GEO. L. J. 1661 (2015) ; Hitoshi Nasu, *Nanotechnology and the Law of Armed Conflict*, in NEW TECHNOLOGIES AND THE LAW OF ARMED CONFLICT 143, 152–154 (Hitoshi Nasu & Robert McLaughlin eds., TMC Asser 2014) ; Hitoshi Nasu, *Nanotechnology and Challenges to International Humanitarian Law: A Preliminary Legal Assessment*, 94 INT'L REV. RED CROSS 653, 657 (2012).

Rather than engaging in detailed consideration of each of these issues, this paper will focus on questions around the legality of the use of invisibility technology for deceptive purposes. While the relevance of perfidy to the regulation of conduct with the use of invisibility technology in warfare is rather limited due to the narrow formulation of the prohibition under the modern law of armed conflict, there are risks that the question of perfidy might arise from the misuse of invisibility technology. Advance consideration is therefore warranted, particularly given that invisibility technology as a deceptive tool will undoubtedly be a topic of particular interest to military strategists, defence forces and their legal advisors, even before it becomes a reality. While the use of optical deception as ruses, of which camouflage is the predominant example, has long been considered acceptable as a method of warfare, invisibility technology is unique and requires specific investigation. Invisibility, as a method of warfare, will significantly increase the scope of possibilities for optical deception and could engage the prohibition against perfidy. To avoid misuse of invisibility technology in violation of the perfidy rule, rigorous assessment of the application of the rule to this novel technology on what will be an entirely different and modernised battlefield is necessary.

This paper first reviews the unique characteristics of invisibility technology and sets out the three criteria of the perfidy rule. It then examines how certain uses of invisibility technology might satisfy, or be used to circumvent, one or more of these criteria, which if cumulatively established would amount to a prohibited act of perfidy. In the course of this discussion, this paper identifies the grey areas of the perfidy rule and raises questions about the rule's adequacy in regulating the uses of invisibility technology on battlefields in light of various legal and practical challenges that arise therefrom. This paper explores legal restrictions on the circumstances in which invisibility technology can be lawfully used and

suggests certain considerations that should guide States in considering when to employ invisibility technology in armed conflict and in training military units to use it as a method of warfare.

II. FROM ART TO SCIENCE: CAMOUFLAGE, STEALTH AND INVISIBILITY TECHNOLOGY

Deception and subterfuge as tactics of warfare have a long history.⁴ The use of optical deception in the form of camouflage first emerged in the mid-19th century when the Corps of Guides, a combined cavalry and infantry unit of the British Army operating in the Punjab began wearing khaki. They used river mud to dye their clothing grey and become “invisible in a land of dust.”⁵ In the early 20th century, France established a military team dedicated to developing stealth attire, presumably in response to the questionable military advantage of wearing brightly coloured pants.⁶ As World War I began, typified as it was by aerial and trench warfare, militaries acknowledged the benefits of camouflage and explored different methods of optical deception, including by consulting naturalists about concealment in the

⁴ See Joseph W. Caddell, *Deception 101—Primer on Deception*, ARMY WAR COLLEGE (Dec. 2004) <https://ssi.armywarcollege.edu/pdffiles/PUB589.pdf>. For a history of camouflage in warfare, see Guy Hartcup, *CAMOUFLAGE: A HISTORY OF CONCEALMENT AND DECEPTION IN WAR* (Pen & Sword Military, 2008); Isla Forsyth, *SECOND WORLD WAR BRITISH MILITARY CAMOUFLAGE: DESIGNING DECEPTION* (Bloomsbury Acad., 2017).

⁵ Tim Newark, *THE BOOK OF CAMOUFLAGE: THE ART OF DISAPPEARING 8* (Bloomsbury Pub., 2013).

⁶ M.J. Stephey, *A Brief History of Camouflage*, TIME MAGAZINE (June 22, 2009) <http://content.time.com/time/nation/article/0,8599,1906083,00.html>.

animal kingdom.⁷ In addition to naturalists, camouflage was initially the work of artists and designers.⁸

Camouflage has since become “one of the basic weapons of war,”⁹ given its success in ensuring force protection, which is its principal objective. Camouflage can minimize losses from enemy offensives and thereby conserve the efficacy of a unit and of the military force as a whole.¹⁰ By taking steps to avoid detection by the enemy, camouflage can assist in attack avoidance, of particular necessity in an age of increased fire power, and thereby reduce the probability of death, injury or capture.¹¹ At its most basic, camouflage lengthens life expectancy.¹² Its benefits are not limited to optical deception on the ground. It has aerial observation avoidance benefits, which is of increasing importance as aerial reconnaissance capabilities develop.¹³ When used as an effective component of force protection, camouflage

⁷ See Forsyth, *supra* note 4, at 15 n.2; Anne Dirouhi Elias, CAMOUFLAGE AUSTRALIA: ART, NATURE, SCIENCE AND WAR 75 (2011).

⁸ N.A.M. Rodger, *Camouflage*, in THE READER’S COMPANION TO MILITARY HISTORY 68–69 (Robert Cowley & Geoffrey Parker eds., Houghton Mifflin Company, 1996).

⁹ Headquarters Department of the Army Washington DC, *Chapter 8: Basics of Defensive Operations*, in U.S. ARMY FIELD MANUAL No. FM 3-90: TACTICS, ¶ 8.70 (July 4, 2001).

¹⁰ Headquarters Department of the Army, *The Dynamics of Combat Power*, in U.S. ARMY FIELD MANUAL 100-5: OPERATIONS, ¶¶ 2-10–2-11 (June 14, 1993).

¹¹ Headquarters Department of the Army Washington DC, *Chapter 8: Basics of Defensive Operations*, in U.S. ARMY FIELD MANUAL No. FM 3-90: TACTICS, ¶¶ 8.67 - 8.68 (July 4, 2001).

¹² Captain Stephen C. Small, *Small Arms and Asymmetric Threat*, MILITARY REVIEW 33, 40 (Nov/Dec., 2000).

¹³ Headquarters Department of the Army Washington DC, *Chapter 8: Basics of Defensive Operations*, in U.S. ARMY FIELD MANUAL No. FM 3-90: TACTICS, ¶ 8.68 (July 4, 2001).

enables its leadership to preserve a unit's offensive firepower to later apply it at a decisive time and place.

It is therefore unsurprising that camouflage continues to have a role in contemporary warfare. Militaries have developed and continue to develop new camouflage patterns driven by operational environments and imperatives. Urban camouflage, for example, was developed for operations in densely populated environments. The advantages of this pattern are not limited to the military sphere—it has flow-on benefits for law enforcement agencies with paramilitary elements.¹⁴ With the development of modern technologies militaries have necessarily turned to scientists and technology to render camouflage more effective for use on the modern-day battlefield. A clear example of this is the release of digital pattern camouflage uniforms in the early 2000s by both the Canadian and US armed forces. The Canadian pattern (CADPAT), on which work began in the mid-1990s,¹⁵ was created with the aim of avoiding detection by reducing infrared signature and limiting detection by thermal-imaging devices.¹⁶ In 2002 the U.S. Marines patented their own camouflage pattern, Marine Pattern Camouflage system (MARPAT). MARPAT offers concealment but has been developed with sufficient flexibility to allow members within a unit to identify each other if required.¹⁷ Using the experience of and lessons learned from the creation of MARPAT, the US Army has attempted to engineer a digital, all-terrain camouflage, known as Universal

¹⁴ Martin J. Dougherty, *CAMOUFLAGE AT WAR: AN ILLUSTRATED GUIDE FROM 1914 TO THE PRESENT DAY* 92 (Amber Books Ltd., 2017).

¹⁵ Matthew Sharp, *Little Known Facts and History About Camouflage of the Western World*, *IMMINENT THREAT SOLUTIONS* (May 2, 2016) <http://www.itstactical.com/gearcom/camouflage/little-known-facts-and-history-about-camouflage-of-the-western-world-2/>.

¹⁶ Dougherty, *supra* note 14, at 87.

¹⁷ *Id.*

Camouflage Pattern (UCP).¹⁸ The Australian Defence Force has similarly revised its Disruptive Pattern Camouflage Uniform (DPCU), originally developed in the 1980s, with the assistance of the Defence Science and Technology Organisation to lower its infrared signature.¹⁹

An alternate method, through which technology has influenced efforts to avoid detection by enemy forces, is stealth (or “low observability”) technology. Rather than concealing an object per se or making it blend into its environment, stealth reduces visibility and probability of detection by radar, infrared or other probe beams.²⁰ Originally introduced in 1983 as a component of the F-117 aircraft, stealth technology is now standard in advanced military aircraft.²¹ In the early 1990s, stealth technology began being used in surface

¹⁸ Menghe Miao & John H. Xin, *ENGINEERING OF HIGH-PERFORMANCE TEXTILES* 360 (Woodhead Pub., 2017).

¹⁹ Commonwealth of Australia, Foreign Affairs, Defence and Trade Legislation Committee, Official Committee Hansard - Budget Estimates FAD&T11 (June 1, 2010); Australian Government Department of Defence, *DMO delivers new generation combat uniform*, CASG BULLETIN (June 2016) <http://www.defence.gov.au/dmo/NewsMedia/DMOBulletin/DMO-delivers-new-generation-combat-uniform>.

²⁰ Neil G. Kacena, *STEALTH: AN EXAMPLE OF TECHNOLOGY’S ROLE IN THE AMERICAN WAY OF WAR* 52 (1995).

²¹ Bradley Perrett, *China’s J-20 Stealth Fighter in Service, Official Says*, *AEROSPACE DAILY & DEFENSE REPORT* (Mar. 13, 2017), <http://aviationweek.com/awindefense/china-s-j-20-stealth-fighter-service-official-says>; Rahul Singh, *India pushing full steam ahead on stealth fighter plane project*, *HINDUSTAN TIMES* (May 29, 2017), <http://www.hindustantimes.com/india-news/india-pushing-full-steam-ahead-on-stealth-fighter-planes-project/story-NHModMHTQa9iblqWG2HfOL.html>; Franz-Stefan Gady, *Will India, Russia Co-Develop a New 5th Generation Stealth Fighter?*, *THE DIPLOMAT* (March 25, 2017), <http://thediplomat.com/2017/03/will-india-russia-co-develop-a-new-5th-stealth-fighter/>; Jamie Bullen,

warships in order to minimize the ship's radar cross section and thereby guard it against anti-ship cruise missiles and radar honing.²²

These developments, particularly when examined in concert with one another, demonstrate the probability that the zenith of stealth-based camouflage—invisibility technology—will be achieved in near future.²³ In fact, when one examines the claims of scientists, corporations and military analysts themselves—and if those claims are to be believed—it would appear that modern science and technology is approaching the aforementioned zenith at a rapid pace.²⁴ Scientists have been using carbon nanotube (incredibly strong and stiff, seamless and hollow cylinders made from carbon molecules) to achieve more effective optical camouflage. There is reason to believe, based on recent experiments, that carbon nanotube sheets could be used to create a mirage-like vision, which

Russia unveils new supersonic stealth fighter jets that can be invisible to enemies, MIRROR (Aug. 14, 2017), <http://www.mirror.co.uk/news/world-news/russia-unveils-new-supersonic-stealth-10985290>.

²² John W. McGillvray, *Stealth Technology in Surface Warships; How This Concept Affects the Execution of the Maritime Strategy*, NAVAL WAR COLLEGE (May 18, 1992) <http://dtic.mil/dtic/tr/fulltext/u2/a253303.pdf>.

²³ *Ultrathin skin takes invisibility cloak technology one step closer to reality*, ABC SCIENCE (Sept. 18, 2015), <http://www.abc.net.au/news/2015-09-18/invisibility-cloak-successfully-tested/6786846>.

²⁴ Akshat Rathi, *The US Army is serious about developing invisibility cloaks*, DEFENSE ONE (May 8, 2015), <http://www.defenseone.com/technology/2015/05/us-army-serious-about-developing-invisibility-cloaks/112291/>; David Hambling, *US army calls for ideas on invisible uniforms for soldiers*, NEW SCIENTIST TECHNOLOGY INSIGHT (May 6, 2015), <https://www.newscientist.com/article/mg22630202-200-us-army-calls-for-ideas-on-invisible-uniforms-for-soldiers/>.

could potentially have military applications.²⁵ Another example is metamaterials, which are used to bend light around and conceal an object, although so far this capability appears to be limited to specific wavelengths and certain angles.²⁶ One biotechnology company claims to have created “Quantum Stealth”—a product, which “renders [a] target completely invisible by bending light waves around it” and, allegedly, removes visual, infrared and thermal signatures, as well as shadows.²⁷ Mechanical engineers are also trying to develop “dynamic camouflage” inspired by cephalopods like a squid or octopus.²⁸

There are claims that various invisibility technologies could potentially achieve the objective of enhanced optical camouflage or adaptive camouflage in the visible and infrared region, although no scientist has mastered complete cloaking beyond adaptive camouflage at the time of writing.²⁹ That said, using optical camouflage across different light spectrums—

²⁵ Ali E. Aliev, Yuri N. Gartstein & Ray H. Baughman, *Mirage effect from thermally modulated transparent carbon nanotube sheets*, NANOTECHNOLOGY 435704, 22(43) (2011).

²⁶ Andrea Di Falco, Martin Ploschner & Thomas F. Krauss, *Flexible metamaterials at visible wavelengths*, 12 NEW JOURNAL OF PHYSICS 113006 (2010).

²⁷ Guy Cramer, *Quantum Stealth; The Invisible Military Becomes A Reality* (Oct. 19, 2012), <http://www.hyperstealth.com/Quantum-Stealth/>.

²⁸ See, for example, Qiming Wang, Gregory Gossweiler et al., *Cephalopod-inspired design of electro-mechano-chemically responsive elastomers for on-demand fluorescent patterning*, NATURE COMMUNICATIONS 4899, 5 (2014); Mark Nicol, *Harry Potter and the Army's invisibility cloak: Military tests Hogwarts-style device that shields troops by projecting their surroundings onto its surface*, DAILY MAIL (March 20, 2016), <http://www.dailymail.co.uk/sciencetech/article-3500893/Military-tests-Hogwarts-style-device-shields-troops-projecting-surroundings-surface.html#ixzz4C580jUmt>.

²⁹ It may be that the full suite of potential invisibility technology is not yet the subject of open source material. Comments made by a former United States Undersecretary of Defense that a research project into

visible light, night vision spectrum, and thermal/infrared spectrum—to cloak soldiers, their weapons and equipment could theoretically enable complete invisibility, undetectable by any conventional means of warfare—that is, unless a new counter-technology is developed to detect invisible soldiers and equipment for military use.

A further benefit of invisibility, that differentiates it from effective camouflage, is its adaptability into any environment. Camouflage will always be tied to the natural environment it is trying to emulate whereas an invisible soldier could easily move between environments at any time, night or day. This adaptability means that invisibility technology will enable a significantly wider variety of covert operations in which manoeuvre will be unobservable. It is this manoeuvrability that renders invisibility technology distinct from traditional camouflage. While camouflage has its military values, its efficacies are limited to that which can be achieved in a certain place. Invisibility technology, on the other hand, will uniquely enable soldiers, their weapons and equipment to move around in any location at any time without detection. The operational range offered by invisibility technology would likely be enhanced further by other novel technology that enhances manoeuvrability such as “nano air vehicles” and self-guiding projectiles.³⁰

stealth technology was given a code name and put into “deep security” suggest this is likely: William J. Perry, *Technology and National Security: Risks and Responsibilities*, Speech at the Conference on Risk and Responsibility in Contemporary Engineering and Science: French and U.S. Perspectives, Stanford University 4 (April 7, 2003). Boothby notes that “vital national security interests” can inhibit the publication of information in relation to weapons review. Bill Boothby, *The law of weaponry – is it adequate?*, in *INTERNATIONAL LAW AND ARMED CONFLICT, EXPLORING THE FAULTLINES: ESSAYS IN HONOUR OF YORAM DINSTEIN* 297, 310 (Michael N. Schmitt & Jelena Pejic eds., Martinus Nijhoff, 2007).

³⁰ Nasu (2014), *supra* note 3, at 152.

Given the impact of invisibility technology on operational planning and options, successful development of such technology will undeniably create countless possibilities for any military that can access the technology. However, blind pursuit of these opportunities without consideration of the legal implications and challenges raised by invisibility technology could cause legal concerns. One concern in particular is that the opportunities offered by invisibility technology are exactly what bring it, potentially, within the realm of prohibited perfidy. Unlike camouflage, in respect of which there is little reason to question its classification within the category of ruse, there will need to be careful consideration about how invisibility technology is used to ensure confidence is maintained regarding the entitlement to and obligation to accord protection under LOAC.

III. PERFDY AND RUSES OF WAR

The prohibition of perfidy is derived, at the fundamental level, from a mixture of humanitarian and pragmatic objectives.³¹ The prohibition aims to prevent the erosion of protections owed by belligerent parties to victims of warfare,³² and to facilitate the termination of hostilities in good faith with some degree of safety.³³ Killing or injuring an

³¹ For detailed analysis of the various groundings of the perfidy prohibition, see Sean Watts, *Law-of-War Perfidy*, 219 MIL. L. REV. 106, 116–147, 171–173 (2014).

³² United Kingdom Ministry of Defence, THE JOINT SERVICE MANUAL OF THE LAW OF ARMED CONFLICT: JSP 383 ¶ 5.9.3 (2004).

³³ United Kingdom War Office, THE LAW OF WAR ON LAND BEING PART III OF THE MANUAL OF MILITARY LAW 308 (HMSO, 1958) (“[G]ood faith, as expressed in the observance of promises, is essential

adversary by resort to perfidy, also referred to as “treachery,”³⁴ has been recognised as an unlawful method of warfare since the seventh century.³⁵ Accordingly, it is unlawful as a matter of customary international law in both international armed conflicts (IACs) and non-international armed conflicts (NIACs).³⁶ The prohibition of perfidy is therefore essentially a rule by which good faith is ensured in the means and methods of warfare and in the conduct of hostilities more broadly.

Perfidy is defined as “[a]cts inviting the confidence of an adversary to lead him to believe that he is entitled to, or is obliged to accord, protection under the rules of international law applicable in armed conflict, with the intent to betray that confidence.”³⁷ Ultimately, a perfidious act is most likely to be subject to criticism where the sense of obligation or

in war, for without it hostilities could not be terminated with any degree of safety...”); United States Department of Defense, THE ARMY FIELD MANUAL, FM27-10: THE LAW OF LAND WARFARE ¶ 50 (Gov’t Prtg. Office, 1956) (describing how perfidious conduct “destroys the basis for restoration of peace”); United States Department of Defense, LAW OF WAR MANUAL 67 (2015).

³⁴ Regulations Respecting the Laws and Customs of War on Land, October 18, 1907, 205 C.T.S. 277, art 23(b) (entered into force 26 January 1910) [hereinafter 1907 Hague Regulations] (“it is especially forbidden... (b) To kill or wound treacherously individuals belonging to the hostile nation or army.”).

³⁵ Gary D. Solis, THE LAW OF ARMED CONFLICT: INTERNATIONAL HUMANITARIAN LAW IN WAR 420 (CUP, 2010).

³⁶ Prosecutor v Tadić, (Judgment) ICTY Appeal Chamber, Case No IJ-94-1, ¶ 125 (October 2, 1993); MANUAL ON THE LAW OF NON-INTERNATIONAL ARMED CONFLICT, rule 2.3.6 (2006); United Kingdom Ministry of Defence, *supra* note 32, ¶ 15.12.1.

³⁷ Protocol Additional to the Geneva Conventions of 12 August, and relating to the Protection of Victims of International Armed Conflicts, Dec. 12, 1977, 1125 U.N.T.S. 3, art 37(1) (entered into force Dec. 7, 1979) [hereinafter AP I]. *See also*, International Criminal Court, ELEMENTS OF CRIMES 24, 39 (2011).

protection incited in the enemy encourages them to forbear from attacking. By contrast, ruses are considered legitimate tactics that belligerent parties have traditionally employed. The comparison between perfidy and ruse can be seen in the Lieber Code, which states that “[m]ilitary necessity ... admits of deception, but disclaims acts of perfidy.”³⁸ This and other instruments suggest a dichotomy between perfidy and ruse: deception is acceptable in war, only when it is not perfidious.³⁹ Even today, ruses remain permissible in both IAC and NIAC.⁴⁰ Examples of acceptable ruses, according to Additional Protocol I, include “the use of camouflage, decoys, mock operations and misinformation.”⁴¹

Formulated as such, the prohibition of perfidy outlaws a specific category of deceptive act. Not all acts of perfidy are prohibited or constitute a war crime under modern LOAC and, therefore, it is important to note that different types of perfidious conduct will have varied legal consequences.⁴² Pursuant to the *Rome Statute of the International Criminal Court*, individual criminal responsibility will attach to the war crime of killing or wounding treacherously “individuals belonging to the hostile nation or army” or a “combatant

³⁸ Instructions for the Government of Armies of the United States in the Field, Army General Orders 100 of 24, art 16 (April 1863) [hereinafter Lieber Code]; Solis, *supra* note 35, at 420. *See also* United States War Department, RULES OF LAND WARFARE § 13 (Gov’t Prtg. Office, 1914) [hereinafter 1914 Rules of Land Warfare].

³⁹ 1914 Rules of Land Warfare, *supra* note 38, § 192.

⁴⁰ *Id.*; 1907 Hague Regulations, *supra* note 34, art 24; AP I, *supra* note 37, art 37(2); International Committee of the Red Cross (ICRC), CUSTOMARY INTERNATIONAL HUMANITARIAN LAW STUDY, Rule 65 (2005).

⁴¹ AP I, *supra* note 37, art 37(2).

⁴² For details, see Watts, *supra* note 31, at 149–155.

adversary.”⁴³ A grave breach of Additional Protocol I will arise if the distinctive emblem of the red cross, red crescent or red lion and sun or other protective signs recognized by the Geneva Conventions and Additional Protocol I are used perfidiously.⁴⁴ Perfidious conduct that leads to the capture of an adversary, unlike that which leads to an enemy’s death or injury, does not give rise to individual criminal responsibility or amount to a grave breach of Additional Protocol I—rather, it is merely unlawful under Additional Protocol I.⁴⁵

This also means that perfidious conduct, which does not result in an enemy’s death, injury or capture, is not prohibited under Additional Protocol I.⁴⁶ This is the result of a

⁴³ Rome Statute of the International Criminal Court, July 17, 1998, 2187 U.N.T.S. 90, arts 8(2)(b)(xi) and 8(2)(e)(ix) (entered into force July 1, 2002). Note that the Rome Statute is substantively faithful to the formulation of perfidy in art 23(b) of the 1907 Hague Regulations in that it refers to killing or wounding treacherously, rather than perfidiously like art 37 of AP I.

⁴⁴ AP I, *supra* note 37, art 85(3)(f). ICRC’s Commentary of 1987 notes that “the effect must be such that, even if it does not cause death, it will affect people in a long-standing or crucial manner, either as regards their physical integrity or their physical and mental health.” Yves Sandoz, Christophe Swinarski & Bruno Zimmerman, COMMENTARY ON THE ADDITIONAL PROTOCOL OF 8 JUNE 1977 TO THE GENEVA CONVENTIONS OF 12 AUGUST 1949 ¶ 3474 (ICRC & Martinus Nijhoff, 1987).

⁴⁵ AP I, *supra* note 37, art 37(1). In NIAC, perfidious capture is not prohibited. See John C. Dehn, *Permissible Perfidy?: Analysing the Colombian Hostage Rescue, the Capture of Rebel Leaders and the World’s Reaction*, 6 J. INT’L CRIM. JUST. 627 (2008); Richard B. Jackson, *Perfidy in Non-International Armed Conflicts*, 88 INT’L L. STUD. 237, 246–247 (2012).

⁴⁶ Mike Madden, *Of Wolves and Sheep: A Purposive Analysis of Perfidy Prohibitions in International Humanitarian Law*, 17 J. CONFLICT SECURITY L. 439, 444 (2012); F. Kalshoven & L. Zegveld, CONSTRAINTS ON THE WAGING OF WAR: AN INTRODUCTION TO INTERNATIONAL HUMANITARIAN LAW 94 (Cambridge U. Press, 4th ed., 2011).

narrow formulation of the perfidy rule adopted by the drafters of Additional Protocol I, with even stricter requirements for the prohibited perfidy to constitute a grave breach of the Protocol. It is not surprising that the perfidy rule in Additional Protocol I is so narrowly formulated and severely limits the circumstances in which an allegation of prohibited perfidy might be made. Had a broader formulation been adopted, it would have been feared that a greater variety of deceptive military conduct could be considered to constitute prohibited perfidy, which would be inconsistent with the long-standing acceptance of ruses as a lawful method of warfare and with the realities of how wars are fought, considering the tactical advantages of cover and concealment.

Given the predication of acceptable ruses on its distinction from perfidy, how then does one identify the difference between perfidy and ruse? Ostensibly a ruse seeks simply “to confuse the enemy, to induce him to act recklessly—to make a mistake or to act impudently;”⁴⁷ unlike perfidy, it does not create an expectation of a particular response under LOAC.⁴⁸ That said, “the line of demarcation, ... between legitimate ruses and forbidden acts of treachery and perfidy is sometimes rather indistinct.”⁴⁹ It is this grey area in particular that this paper explores in respect of the use of invisibility technology as a method of warfare.

This paper focuses on the implications of invisibility technology for the prohibited act of perfidy—namely, killing or injuring an adversary (or capturing an adversary if Additional Protocol I applies) by resort to perfidy. It is important to note at this stage that it would be

⁴⁷ Solis, *supra* note 35, at 426.

⁴⁸ AP I, *supra* note 37, art 37(2).

⁴⁹ 1914 Rules of Land Warfare, *supra* note 38, ¶ 192.

misleading to make a broad claim that invisibility technology is or is not, by its nature, a perfidious means or method of warfare.⁵⁰ Rather, it will be necessary to consider whether, and under what circumstances, any specific use of invisibility technology amounts to a prohibited act of perfidy. The answer to this question will depend upon the specific manner in which invisibility technology is used and the extent to which its use might satisfy any (or all) of the requisite criteria for perfidy. To that end, the remainder of this paper examines this question according to the three criteria, of which the prohibited act of perfidy comprises: (1) an act inviting the confidence of an adversary, derived from the specific protection provided for under the rules of international law applicable in armed conflict; (2) an intent to betray that confidence; and (3) resulting in death or injury of the adversary (or capturing if Additional Protocol I applies).⁵¹

IV. USES OF INVISIBILITY TECHNOLOGY AS A METHOD OF WARFARE

A. Inviting the Confidence of an Adversary of Entitlement to or Obligation to Provide Protection

Under this criterion, an act must incite an expectation connected to the protection in LOAC—whether that be protection to which one is entitled, or which one owes. Unlike using a white flag of surrender or a protected emblem as cover for a surprise attack, combatants who use invisibility technology to cloak themselves or a military object will not necessarily create a perception of the requisite character to enliven this criterion. Invisible persons or

⁵⁰ *Cf.* Sahni, *supra* note 3, at 1675.

⁵¹ *Cf.* Michael N. Schmitt, TALLINN MANUAL 2.0 ON THE INTERNATIONAL LAW APPLICABLE TO CYBER OPERATIONS 492 (Cambridge Univ. Press, 2016) [hereinafter Tallinn Manual 2.0].

objects are not accorded any specific protection under LOAC and the rendering of a military object or a soldier invisible (even if they are in the vicinity of protected persons or objects) does not equate to or create protection. An argument that could therefore be conceivably made is that invisibility technology is merely an extension of camouflage—concealment in and of itself does not create any assurance of or obligation to provide protection.⁵²

However, there are undeniably ways in which invisibility technology could be used to enable a disguised operation in a manner that invites an adversary to believe that the person or object involved enjoys civilian or other protected status.⁵³ Invisibility technology is particularly effective in concealing military attributes, such as weapons and military equipment that would render the object a legitimate target.⁵⁴ Transporting invisible soldiers in a civilian or medical vehicle through military checkpoints of enemy forces, disguising an armed hoverboard vehicle as an air delivery drone by cloaking its weapon system, or mounting a cloaked projectile on a civilian speedboat, are all examples of the use of invisibility technology to invite in the adversary the requisite confidence that it owes protection to what would appear ostensibly to be a civilian object.⁵⁵ In these situations, the use of invisibility technology enables combatants and their weapons to dissimulate their actual status and instead pretend to be civilian or of an otherwise legally protected status before launching attacks.

⁵² Solis, *supra* note 35, at 423.

⁵³ See Tallinn Manual 2.0, *supra* note 51, at 494.

⁵⁴ AP I, *supra* note 37, art 52(2).

⁵⁵ The principle of distinction applies even in the maritime context: see, International Institute of Humanitarian Law, SAN REMO MANUAL ON INTERNATIONAL LAW APPLICABLE TO ARMED CONFLICTS AT SEA ¶¶ 39-39.2 (1995).

These examples provide guidance only to the extent that they occur in the context of a military environment in which technological means to detect the presence of cloaked combatants and weapons has not yet developed. Were, for example, an adversary to have access to a weapons detection technology with the ability to detect and distinguish a unique set of electromagnetic characteristics that emanates from weapons and military equipment as opposed to civilian objects, the cloaked weapons and military equipment would be detectable by technological means and therefore the adversary would be able to distinguish between civilian objects, to which it owes protection, and the military one which is a legitimate target under LOAC. One may argue that in such circumstances the use of invisibility technology to disguise a military object would not meet the criterion of inviting the requisite confidence of the adversary that it owes protection. However, it is important to note that such an argument—predicated as it is upon the availability of technological means to detect what would otherwise be disguised objects—may lead to discriminatory application of the law.⁵⁶ Moreover, by extrapolation, the same argument could be used to suggest that what has typically been considered conventional and undeniably criminal acts of perfidy, like combatants disguising themselves as civilians or wearing a protected emblem, would no longer be prohibited simply because the other party to the conflict possessed the technological capability to identify the true status of those combatants, for example, by detecting an electromagnetic signature unique to firearms.

⁵⁶ Michael N. Schmitt, *The Principle of Discrimination in 21st Century Warfare*, 2(1) YALE HUM. RTS. DEV. J. 143, 155 (1999).

Those arguments aside, the mere disguise of a military object to appear to be of civilian or otherwise legally protected status does not in and of itself satisfy this criterion.⁵⁷ An adversary's confidence derived from protections under LOAC must be invited in such a way as to prompt the adversary to act in forbearance by refraining from exercising his or her right to attack. Invisible soldiers disguising themselves against the side of a civilian residence would not be engaging in perfidy. Were the invisible soldiers simultaneously firing at enemy combatants, this might be a different question and may give rise to reasonable allegations of perfidy.⁵⁸

Similarly, it has been argued that planting an explosive device inside a civilian vehicle parked along a street and detonating it when a legitimate target approaches the vehicle does not satisfy this criterion.⁵⁹ On the other hand, an armoured vehicle parked amongst civilian vehicles and using invisibility technology to take on their visual attributes may cross the line between ruse and perfidy.⁶⁰

⁵⁷ J. Ashley Roach, *Ruses and Perfidy: Deception During Armed Conflict*, 23 UNIV. TOLEDO L. REV. 395, 400 (1992).

⁵⁸ Marty Lederman, *Perfidy, Ambush, Snipers, and the COLE Bombing (al Nashiri) Case*, JUST SECURITY (March 24, 2015), <http://justsecurity.org/21398/perfidy-ambush-snipers-cole-bombing-al-nashiri-case/>.

⁵⁹ See Robert Lawton Pratt, *The International Legal Prohibition on Perfidy and Its Scope in Non-International Armed Conflict*, 56 VA. J. INT'L L. DIG. 1, 7–8 (2016). Cf. Rogier Bartels, *Killing with Military Equipment Disguised as Civilian Objects is Perfidy*, JUST SECURITY (March 20, 2015), <https://www.justsecurity.org/21285/disguising-military-weapons-civilian-equipment-perfidy-or-be/> (arguing that in circumstances where a civilian car is specially modified so that a bomb can be mounted on it, the car becomes a military object that looks like a regular civilian vehicle).

⁶⁰ Eric Talbot Jensen, *The Future of the Law of Armed Conflict: Ostriches, Butterflies, and Nanobots*, 35 MICH. J. INT'L L. 253, 316 (2014).

For completeness it should be noted that examinations of this criterion often overlook the situation in which an act invites an adversary's confidence that he or she is entitled to protection himself or herself.⁶¹ A scenario in which invisibility technology might be used accordingly would be if the combatant were *hors de combat*, had laid down his or her weapons on the reasonable expectation of protection from targeting,⁶² because the adversary lowered their weapons, but was then attacked by invisible soldiers of the adversary.

This and the other examples discussed in this section demonstrate the ease, with which invisibility technology could be used to satisfy the first criterion. The key distinction between a ruse and perfidy in relation to this criterion will be whether the use of invisibility technology creates the requisite level of confidence in an adversary that he or she is entitled to protection or owed an obligation to accord protection under LOAC. Without that confidence, a use of invisibility technology will not be perfidious.

⁶¹ Bartels, *supra* note 59.

⁶² AP I, *supra* note 37, art 41.

B. *Disguised Intent to Betray the Confidence of an Adversary*

Invisibility technology could also be used to disguise the intent to betray the requisite confidence of the adversary discussed above. Imagine that several wounded soldiers sought refuge in an enclosed area under constant surveillance by enemy forces. A group of enemy soldiers entered the enclosed area, having confirmed that the wounded soldiers were disarmed and there was no sign of other hostile forces. The wounded soldiers would be *hors de combat* and therefore protected, whereas the entire area where they sought refuge is not. Unbeknownst to the enemy soldiers, a battalion of invisible soldiers were also situated in the enclosed area and took advantage of the enemy soldiers, having disarmed themselves by reason of the confidence they had in the obligations of protection they owed to the soldiers rendered *hors de combat*.

Although this may seem at first blush to be a clear case of perfidy, there are complicating factors. While the wounded soldiers might have invited the requisite confidence of the adversary, it is unclear that they themselves intended to betray their adversary's confidence because a different unit of invisible soldiers was responsible for the attack and by extension the betrayal. This is what Mike Madden refers to as an "identity separation" between the deceiving and attacking forces.⁶³ Identity separation of the nature described above would be particularly relevant when units are operating as part of joint or multinational forces. This challenge could conceivably arise if intra-unit communication is not fully or

⁶³ Madden, *supra* note 46, at 448.

effectively synchronised, especially given that, for example, separate forces maintain separate communication systems despite operating as one multinational force.⁶⁴

Whether the example cited above could be viewed as perfidious would depend on the level of communication, planning and coordination between the two separate units. It would be necessary to show that both of the units involved had collectively created and shared an intention to betray their enemy's confidence in the protection it owed to those wounded soldiers. Realistically, there would be difficulties collecting evidence to this effect, not least of all because of the possibility that soldiers within units might protect each other were such allegations to arise.⁶⁵

It is possible that in such a situation the invisible soldiers might merely have been in pursuit of the enemy forces and chose to opportunistically strike them when the enemy forces stopped at the enclave. Unlike camouflaged soldiers who are limited in their concealment to the natural environment surrounding them (and whose position at any point in time would be known to all other units in the force), invisibility technology enables greater mobility for the units using it. Consequently, it is conceivable that militaries may limit communication between an invisibility-enabled unit and other units within the same force and choose not to inform other units about the tactical objectives of the invisibility-enabled unit. Interception of

⁶⁴ United States Chairman of the Joint Chiefs of Staff, JOINT PUBLICATION 3-16: MULTINATIONAL OPERATIONS III-19 (July 16, 2013).

⁶⁵ There have been suggestions that soldiers engage in intra-unit protection where allegations of unlawful conduct are made. Dan Oakes & Sam Clark, *SAS soldier cleared of war crimes after cutting hands off dead Taliban suspects in Afghanistan*, ABC NEWS (Sept. 14, 2017), <http://www.abc.net.au/news/2017-09-14/sas-soldier-cleared-over-severed-hands-incident-in-afghanistan/8944364>.

such communication and/or inciting a soldier to betray his or her unit by sharing intelligence with the enemy could, in a future world, be the only way for an adversary to detect invisibility-enabled units (noting the aforementioned caveat that such a situation would be dependent on the availability of detection technology). Although admittedly speculative, these possibilities are reasonably foreseeable and render identity separation an even more challenging factor in any assessment of whether a use of invisibility technology is perfidious. Identity separation demonstrates the difficulties that will pervade in assessing whether the intent to betray criterion has been met.

Of greater concern is what the above analysis indicates about the operational integrity of the prohibition of perfidy. The practical difficulties revealed suggest that when invisibility technology is used in the future, the prohibition against perfidy may no longer have a meaningful effect in meeting the objectives that underpin either of the rationales for its existence discussed above. Put simply, these difficulties indicate that the possibility of being subject to covert attack by invisible soldiers might disincline enemy forces from rendering medical assistance to their wounded, sick or shipwrecked adversaries. Moreover, it shows the ways in which invisibility technology would put significant pressure on the modicum of good faith required between belligerents to ensure hostilities might be safely terminated.

C. Using Invisibility to Kill or Injure the Adversary by Resort to Perfidy

The third way in which invisibility technology might be used in the context of a perfidious act is to disguise the causal link between the act of perfidy and the attack that leads to the death or injury of an adversary. As noted above, an act of perfidy is not prohibited

under LOAC unless it causes an adversary's death or injury (or capture if Additional Protocol I applies). To further elucidate, the example of an armed hoverboard vehicle equipped with invisible weapons to disguise itself as an air delivery drone would not be engaging in an illegal act of perfidy if its sole purpose was intelligence gathering or reconnaissance. Similarly, using a civilian or medical vehicle to transport invisible soldiers through military checkpoints would not necessarily fall foul of the perfidy rule if those invisible soldiers were merely on a hostage rescue mission, during the course of which they did not kill, injure or capture any enemy soldiers.⁶⁶

Given the importance of causality in establishing the occurrence of a prohibited act of perfidy,⁶⁷ it seems likely that this third criterion is another context in which invisibility technology might be used to circumvent the prohibition of perfidy—more specifically by disguising the causal link between the act of perfidy and the act of killing or injuring the adversary. Consider, for example, that the aforementioned hoverboard vehicle (with its weapons cloaked) was collecting imagery for tactical targeting, rather than for reconnaissance only. If the information the hoverboard vehicle collected were then used to launch an attack on a high-level target with its cloaked weapons, which resulted in his or her death, the invisibility technology could easily have been used perfidiously to the extent that the enemy did not attack the hoverboard vehicle, believing it was a commercial air delivery drone. However, this causational connection becomes more untenable if the imagery this hoverboard vehicle collected merely formed part of the intelligence used for tactical targeting and the actual attack was launched by an air strike.

⁶⁶ Note, however, that such use of medical vehicles may violate other rules of LOAC, such as AP I, *supra* note 37, art 12(4).

⁶⁷ Madden, *supra* note 46, at 451.

Exploring the example of invisible soldiers in a medical vehicle mentioned above further, we can see how invisibility technology might be used perfidiously and potentially have adverse effects on combatants' good faith adherence to the very protection the prohibition was introduced to preserve. Imagine that the personnel inside the medical vehicle were unaware that concealed in its undercarriage was an explosive device rendered invisible and an invisible soldier with the capacity to remotely detonate the device. In this scenario, the soldier has arguably not invited the confidence of his or her adversaries that they were obliged not to target the medical vehicle,⁶⁸ or any medical personnel inside it;⁶⁹ yet this criterion has been fulfilled. Making what would be a reasonable assumption in these circumstances, the soldier likely formed an intent to betray his or her adversary's confidences in the protection owed to the medical vehicle and its personnel. Once through the checkpoint, the invisible soldier leaves the medical vehicle, enters a part of the camp in which a high-value target is located, positions the explosive device in proximity of the high-value target, escapes to a safe distance and remotely explodes the device killing his or her adversary.

These are examples of invisibility technology being used to disguise the causal link between the act of perfidy and the attack. Such an operation would have several possible consequences; the attacked force might suspect the medical personnel of the attack, as a result of which it might be reluctant to seek medical assistance for its own soldiers; the force might suspect betrayal within its ranks or even that the high-value target had committed suicide, which (depending on his or her role in commanding the forces) could have a

⁶⁸ AP I, *supra* note 37, art 12(1).

⁶⁹ AP I, *supra* note 37, art 13(2).

profound impact on morale; the invisible soldier is likely to have escaped unscathed without any of the enemies having perceived of his or her presence or involvement in the attack. It is not hard to see why armed forces might be inclined to use invisibility technology in these circumstances, given the flow-on tactical advantages and, most crucially, the immense difficulty that an adversary or an accountability mechanism would face in establishing a causal connection between the attack and the perfidious conduct. This causal conundrum has long been recognized as a legal lacuna in the perfidy rule. The ICRC Commentary on Additional Protocol I notes:

It will be no easy matter to establish a causal relation between the perfidious act that has taken place and the consequences of the combat. The authors [of this commentary] consider that it follows that there remains a sort of grey area of perfidy which is not explicitly sanctioned as such, in between perfidy and ruses of war. This grey area forms a subject of permanent controversy in practice as well as in theory.⁷⁰

Michael Bothe, Karl J. Partsch and Waldemar A. Solf seek to resolve this issue by identifying a standard of causation for an act of perfidy, which “must be [that the act is] the proximate cause of the killing, injury or capture,” dismissing a remote causal connection such as a lethal ambush arising from earlier, feigned injury as inadequate to establish prohibited perfidy.⁷¹

⁷⁰ ICRC Commentary on Additional Protocol I, *supra* note 44, 433, ¶ 1492.

⁷¹ Michael Bothe, Karl Josef Partsch & Waldemar A. Solf, *NEW RULES FOR VICTIMS OF ARMED CONFLICTS* 204 (1982).

This standard is also used in the Tallinn Manual on the International Law Applicable to Cyber Operations.⁷²

There is an alternative view as to the standard of causation for the purposes of determining whether a perfidious act has resulted in the death or injuring of an enemy, which render it prohibited under customary international law. In an attempt to fill the legal gap caused by the words “by resort to” in the definition of perfidy, Mike Madden has proposed using the tests of causation in tort law, particularly the “but for” test.⁷³ The “but for” test establishes causation where a tortious injury would not have occurred “but for” the actions of the tortfeasor. The adequacy of reliance on this standard is debatable, particularly for the purposes of criminal prosecution, because it is more of a factual than a legal test. At any rate, in a scenario like that described above, such a test would not assist, due to the practical difficulties in identifying and proving the disguised causal link between the act of perfidy and the attack.

V. PROSPECT OF PERFIDY DEBATE WITH THE USE OF INVISIBILITY TECHNOLOGY

The final scenario discussed above was admittedly designed to expose both theoretical and operational flaws in the prohibition of perfidy in the context of invisibility technology. Calculated though it was, the scenario is useful in that it indicates why the prohibition could easily be circumvented, posing questions as to the efficacy of the prohibition of perfidy, as it is currently formulated, in regulating treacherous conduct in

⁷² Tallinn Manual 2.0, *supra* note 51, at 492.

⁷³ Madden, *supra* note 46, at 450–454.

increasingly more multifarious modern battlefields. Is the current formulation of the prohibition of perfidy still the most effective and appropriate barometer of whether deceptive stratagems are acceptable ruse or unlawful behaviour? In many ways, this is not a new question. In particular, much criticism has been levied at the prohibition of perfidy because of the grey areas from which it suffers—most notably, the category of behaviour that seems to fall somewhere in between acceptable ruse and the prohibited act of perfidy.⁷⁴

The examples discussed in this paper demonstrate the tactical advantages that invisibility technology could deliver in respect of misleading an adversary in a way that invites confidence in an entitlement to or an obligation to provide protection, in betraying that confidence, or in disguising the causal link between the act of perfidy and the killing, injuring or capturing of the adversary. These tactical advantages raise a question as to whether the three elements in Article 37 of Additional Protocol I remain the most effective criteria. Admittedly, Article 37 has the benefit of being a clear articulation of what elements are required before it can be deemed that deceptive tactics have violated LOAC. The tactical advantages offered by invisibility technology will nevertheless generate a whole new range of practical challenges in the effective regulation of treacherous conduct under the current regime prohibiting perfidy.

A further challenge arises when invisibility technology is employed to disguise multiple elements of a prohibited act of perfidy. Consider the example of invisible soldiers hidden in a medical vehicle. Assuming the driver of the medical vehicle was in the same unit

⁷⁴ See, e.g., Matthew J. Greer, *Redefining Perfidy*, GEO. J. INT'L L. 241 (2015); Byron D. Greene, *Bridging the Gap That Exists for War Crimes of Perfidy*, ARMY LAWYER 45 (2010).

as the invisible soldiers and they had collectively agreed to use perfidy to betray the confidence of their adversary for the purposes of undertaking a mission to disrupt the enemy's air defence system. Were the soldiers to launch an attack as soon as the medical vehicle had moved through the checkpoint, this would be a clear violation of the prohibition of perfidy. Imagine, though, that the invisible soldiers proceeded to set up a radar-jamming device to disrupt the adversary's air defence system prior to launching air strikes. During the course of their operation the medical vehicle had returned from whence it came. In this scenario, the act of inviting confidence relates solely to the entry of invisible soldiers into the enemy territory, whereas their intention to betray that confidence is limited to gaining tactical advantage in aid of forthcoming air strikes. The key issue then will be to determine whether there is a sufficient nexus between perfidious conduct and attacks leading to death, injury or capture of an adversary.

This legal ambiguity, as well as practical difficulties examined above, indicates that the prohibition of perfidy, as it is currently formulated, may not remain as an effective legal tool to ensure that deceptive conduct does not undermine the confidence in the legal protection under LOAC. A widespread use of invisibility technology, if it becomes an intractable element of warfare in future, might have the effect of discouraging armed forces from exercising precautions in identifying legitimate targets or from rendering medical assistance for wounded, sick or shipwrecked adversaries and civilians, as they suspect the presence of invisible soldiers, weapons or military equipment nearby.

Given the practical challenges it is likely to pose to the application of the rule, it might be expected that states develop a pattern of self-restraint upon the use of invisibility

technology when it is reciprocated by other actors. In light of the discussion above demonstrating how invisibility technology could be used to fulfil or circumvent any or all of the three criteria of a prohibited act of perfidy, it is submitted that such a pattern of self-restraint take into account the following considerations in order to maintain the integrity of legal protection afforded under LOAC:

- The use of invisibility technology is permissible to protect civilians and other victims of war from attacks and effects of attacks;
- Invisibility technology should not be employed to engage in hostilities in areas proximate to protected persons, civilians or civilian objects;
- When invisibility technology is used for force protection objectives, no invisible soldier or object should be involved in offensive operations during the period of their invisibility;
- When invisibility technology is used for targeting, even greater care than usual should be exercised to avoid confusing an enemy about distinction between combatants and civilians not taking part in hostilities, or between legitimate military objectives and civilian objects;
- When invisibility technology is used in a military operation with an intent to betray the confidence of an adversary in the protection owed to a person or an object, care should be exercised to avoid using it as a proximate cause of death or injury (or capture if Additional Protocol I applies).

The application of these considerations in the planning and execution of a military operation is consistent with the obligation of states to ensure respect for LOAC.⁷⁵

⁷⁵ ICRC, CUSTOMARY INTERNATIONAL HUMANITARIAN LAW STUDY, rule 139 (2005).

VI. CONCLUSION

Invisibility technology will create immense tactical advantages to any military using it on future battlefields. However, as this paper has demonstrated, invisibility technology could be used to effectively circumvent the prohibition of perfidy. By examining a range of scenarios, this paper has highlighted the legal and practical challenges posed by widespread use of invisibility technology. Having exposed the various legal and practical difficulties arising from the use of invisibility technology in applying the prohibition of perfidy, this paper has posed questions about the adequacy of the current formulation of the perfidy rule in regulating battlefields of the future.

In light of the various possibilities as to how invisibility technology could be used to fulfil or circumvent any or all of the three criteria of a prohibited act of perfidy, this paper has offered key considerations about the possible ways in which the use of invisibility technology can be restricted in a way that contributes to the maintenance of the integrity of legal protection afforded under LOAC. Given the practical challenges it is likely to pose to the application of the rule, creating a new rule or reformulating the perfidy rule does not offer an easy solution. However, as technological advances reach the point where invisibility technology is readily deployable to serve practical needs for military purposes, it might be expected that States develop a pattern of self-restraint upon the use of invisibility technology when it is reciprocated by other actors.