

WORKING PAPER NO. 394

THE USE OF
DEPLETED URANIUM AMMUNITION IN
OPERATION *IRAQI FREEDOM*: A WAR CRIME?

Christopher Michaelsen

*Canberra
January 2005*

National Library of Australia

Cataloguing-in-Publication entry:

Michaelsen, Christopher, 1975-
The Use of Depleted Uranium Ammunition in
Operation *Iraqi Freedom*: a War Crime?

Bibliography.

ISBN 0 7315 5462 0.

1. Iraq War, 2003. 2. War crimes - Iraq.
I. The Australian National University. Strategic and
Defence Studies Centre. II. Title. (Series: Working paper
(The Australian National University. Strategic and
Defence Studies Centre); no. 394).

956.70443

This book is copyrighted to the Australian National University. Apart from any fair dealing for the purposes of private study, research, criticism or review as permitted under the Copyright Act, no part may be reproduced by any process without written permission. Inquiries should be made to the publisher. This book must not be circulated in any other binding or cover.

Strategic and Defence Studies Centre

The aim of the Strategic and Defence Studies Centre, which is located in the Research School of Pacific and Asian Studies in The Australian National University, is to advance the study of strategic problems, especially those relating to the general region of Asia and the Pacific. The centre gives particular attention to Australia's strategic neighbourhood of Southeast Asia and the Southwest Pacific. Participation in the centre's activities is not limited to members of the university, but includes other interested professional, diplomatic and parliamentary groups. Research includes military, political, economic, scientific and technological aspects of strategic developments. Strategy, for the purpose of the centre, is defined in the broadest sense of embracing not only the control and application of military force, but also the peaceful settlement of disputes that could cause violence.

This is the leading academic body in Australia specialising in these studies. Centre members give frequent lectures and seminars for other departments within The Australian National University and other universities and Australian service training institutions are heavily dependent upon SDSC assistance with the strategic studies sections of their courses. Members of the centre provide advice and training courses in strategic affairs to the Australian Department of Defence and Department of Foreign Affairs and Trade. Regular seminars and conferences on topics of current importance to the centre's research are held.

Since its inception in 1966, the centre has supported a number of visiting and research fellows, who have undertaken a wide variety of investigations. Recently the emphasis of the centre's work has been on problems of security and confidence-building in Australia's neighbourhood; the defence of Australia; arms proliferation and arms control; policy advice to the higher levels of the Australian Defence Department; and the strategic implications of developments in Southeast Asia, the Indian Ocean and the Southwest Pacific.

Publications Program

The centre maintains a comprehensive collection of reference materials on strategic issues. Its publications program, which includes the Canberra Papers on Strategy and Defence and SDSC Working Papers, produces up to two dozen publications a year on strategic and defence issues. An abridged list of SDSC publications appears at the end of this volume.

Editorial Board

Professor Paul Dibb
Professor Desmond Ball
Professor David Horner
Professor Hugh White
Dr Coral Bell
Dr Alan Dupont
Professor Anthony Milner
Professor Virginia Hooker

SDSC Working Papers

Series Editor: Meredith Thatcher
Published and distributed by:
Strategic and Defence Studies Centre
The Australian National University
Canberra ACT 0200
Australia
Tel: 02 6125 9921
Fax: 02 6125 9926

About the Author

Christopher Michaelsen is a doctoral candidate at the Strategic and Defence Studies Centre, The Australian National University. His research interests include international law, disarmament and counter-terrorism. His current research focuses primarily on domestic responses to terrorism in the United Kingdom, Germany, Japan and Australia. Mr Michaelsen has studied law and international relations at the University of Munich and graduated in law from the University of Hamburg, Germany. He also holds a Master of Laws (LLM) from the University of Queensland specialising in international and security law.

This paper represents the author's views alone. It has been drawn entirely from open sources, and has no official status or endorsement.

Author's Note

Acknowledgement

The author would like to thank Dr Robert Ayson and Dr Richard Brabin-Smith for their helpful comments. Any remaining errors are the author's sole responsibility.

Abstract

This paper examines whether or not the use of Depleted Uranium ('DU') ammunition by British armed forces in 'Operation Iraqi Freedom' may have constituted a war crime. It is analysed whether and to what extent the use of DU ammunition is in breach with obligations under international humanitarian law of armed conflict. The provisions examined include the customary prohibition of indiscriminate attacks, the customary prohibition of weapons causing superfluous injury, and the obligation to protect the environment as codified in the Additional Protocol I to the Geneva Convention. It is argued that the use of DU ammunition raises serious concerns in relation to several provisions of international humanitarian law. Nevertheless, it appears rather unlikely that the use of DU ammunition by Coalition forces in Iraq was authorised with criminal intent and thus constituted war crimes.

The Use of Depleted Uranium Ammunition in Operation Iraqi Freedom: a War Crime?

Christopher Michaelsen

In late July 2003 a group of Greek lawyers from the Athens Bar Council filed a law suit with the International Criminal Court (ICC) in The Hague indicting British Prime Minister Tony Blair and other senior members of the United Kingdom (UK) government and military for allegedly breaching international law and committing war crimes during the military campaign against Iraq.¹ The allegations included the killing of Iraqi civilians, depriving the population of drinking water in cities such as Basra, the bombardment of residential areas, and the use of allegedly prohibited weapons like cluster bombs and weapons containing depleted uranium (DU). While the killing of civilians and the bombardment of residential areas usually amount to violations of the law of armed conflict (and in some circumstances constitute war crimes), it is unclear whether or not the use of weapons containing DU is prohibited by customary or treaty rules of international humanitarian law. To this day, DU ammunition has not been addressed specifically by any treaty, nor has its use been subject to judicial scrutiny by any international court. Although the chief prosecutor of the International Criminal Tribunal for the former Yugoslavia apparently looked into the use of the controversial ammunition during NATO's 1999 campaign in Kosovo, there were not 'enough elements to proceed'.²

This paper will examine whether or not the aforementioned members of the British government or British military commanders may have committed war crimes by authorising the use of weapons containing DU in the recent military campaign against Iraq.³ The British Government was singled out for examination for two reasons: the United Kingdom and the United States were the only two members of the 'Coalition of the Willing' that have officially confirmed the use of DU ammunition in the recent war against Iraq. In contrast to the United States, however, the United Kingdom is party to the 1977 Protocol Additional I to the 1949 Geneva Convention and the 1998 Rome Statute of the International Criminal Court. Both international instruments partly codify customary international humanitarian and criminal law (which is also legally binding for the United States). But some of the treaty provisions are more specific and exceed the obligations recognised by customary law. Such provisions are only binding for parties to the treaties such as the United Kingdom. It is interesting to note that Australia is also party to the 1977 Protocol Additional I to the 1949 Geneva

Convention and the 1998 Rome Statute of the International Criminal Court. However, Australia did not use DU ammunition in the recent campaign against Iraq.

In a first step, the analysis will focus on the question of whether, and to what extent, the use of DU ammunition is consistent with obligations under contemporary international humanitarian law. Particular attention will be drawn to the relevant provisions of the 1977 Protocol Additional I to the 1949 Geneva Conventions (AP I). The provisions examined include the customary prohibition of indiscriminate attacks,⁴ the customary prohibition of weapons causing superfluous injury,⁵ and the obligation to protect the environment.⁶ The paper will then discuss whether breaches of any of these provisions could give rise to individual criminal responsibility; that is, whether the use of DU weaponry could constitute a war crime.⁷ It is argued that, although the use of DU weapons raises serious concerns in relation to some of these provisions, individual criminal responsibility of members of the British Government and/or armed forces for the use of DU ammunition in the recent war against Iraq cannot be established.

Weapons Containing Depleted Uranium

Weapons containing DU are of relatively recent use. They were first used on a wide scale during the Gulf war in 1991.⁸ Subsequently, DU ammunition was used in the Balkans,⁹ in Afghanistan¹⁰ and in the 2003 war against Iraq.¹¹ Ammunition tipped with DU enhances a weapon's ability to penetrate armour. DU ammunition is therefore primarily used against tanks and other armoured vehicles. DU is a waste product of the process of enriching the concentration of the fissile isotope U-235 in naturally occurring uranium for use in light-water power plants and nuclear weapons production.¹² It is an extremely dense metal, almost twice as dense as lead. In solid form, DU ammunitions emit only trace amounts of radiation that are not enough to pose a risk to humans.¹³ However, upon impact with an enemy tank or armoured vehicle, the DU liquefies and burns, opening the tank's surface to allow the charge to enter and explode, thereby destroying the vehicle. This intense heat reaction pulverises the munitions and causes the vaporisation of a radioactive and chemically toxic dust, which contains uranium oxide particles.¹⁴ These uranium oxide particles emit alpha, beta and gamma radiation and are small enough to be inhaled.¹⁵ Of the aerosolised particles produced, sixty percent are particles less than five microns in diameter (less than ten microns being considered as respirable size).¹⁶ US Army field tests have shown that when a vehicle is struck by a DU penetrator, the heaviest contamination occurs within five to seven metres

of the vehicle. Nevertheless, contamination can also occur beyond this area. DU particles thrown into the air by the rounds' impact or by resultant fires and explosion can be carried downwind for twenty-five miles or more.¹⁷

The issue of health effects of exposure to DU on combatants and civilians is deeply political and has been debated controversially for some time. Proponents of DU weaponry deliberately downplay DU's health effects and dismiss any concerns in relation to DU ammunition. Anti-DU activists, on the other hand, condemn the use of DU munitions, claiming that these weapons are weapons of mass destruction. As scientific research has revealed, DU ammunition is neither as harmless as proponents claim it is, nor is it 'genocidal' as anti-DU activists often allege. Nevertheless, while further research is needed, a number of adverse health effects have already been attributed to the use of DU.

Just prior to the 1991 Gulf War, the US Army Armament, Munitions, and Chemical Command released a comprehensive report comparing the use of DU with tungsten alloy in armour-piercing ammunition. The report noted that DU munitions have greater penetration ability than tungsten alloy ammunition, but it warned that 'aerosol DU exposures to soldiers on the battlefield could be significant with potential radiological and toxicological effects,' including 'cancer when exposures are internal.' The report predicted that 'following combat, the condition of the battlefield, and the health risks to natives and combat veterans may become issues in the acceptability of the continued use of DU for military applications.'¹⁸ Research undertaken by the US Armed Forces Radiobiology Research Institute draws similar conclusions. A 1999 report discovered possible relationships between DU and neurological, immunological, carcinogenic, genotoxic, and mutagenic effects.¹⁹ The study identified four health effects of concern: (1) cancer; (2) immune system damage; (3) central nervous system problems; and (4) damage to reproductive systems.

According to a 2002 report by the Royal Society (UK), the majority of soldiers on the battlefield will be exposed to levels of DU from armour-piercing penetrators that are unlikely to cause heavy metal poisoning. However, the report concluded that the kidneys of soldiers may be damaged if they inhale large quantities of DU after their vehicle is struck by a penetrator or while working for long periods in contaminated vehicles. The report also warns that the soil around penetrator impact sites may be contaminated by DU, and could be harmful if swallowed by children for example.²⁰ It is interesting to note in this context that a 1995 article in the US Army magazine *Armor* offered practical advice on minimising exposure to DU:

If you find radioactive DU contamination on a vehicle, move the vehicle to a site away from water sources, food storage, or eating areas, and occupied bivouac sites. ... Of course, always keep personnel away from contaminated equipment or terrain unless required to complete the mission.²¹

Other research also points to serious dangers to health from the explosion of DU ammunition.²² In particular, some have suggested that DU contributed to the infamous 'Gulf War Syndrome', an array of chronic illnesses that have apparently affected over 90,000 US veterans.²³ The Uranium Medical Research Centre in Canada and the United States, and centre research associates Patricia Horan and Leonard Dietz, published a study in the August 2002 issue of the medical journal, *Military Medicine*. The study is believed to be the first to look at inhaled DU among Gulf War veterans, using the ultra-sensitive technique of thermal ionization mass spectrometry, which enabled them to easily distinguish between natural uranium and DU. The study, which examined British, Canadian and US veterans, all suffering typical Gulf War Syndrome ailments, found that, nine years after the war, 14 of 27 veterans studied had DU in their urine. DU was also found in the lung and bone of a deceased Gulf War veteran.²⁴ Similarly, Doug Rokke, a US Army health physicist assigned to clean up DU in Iraq in 1991, reported that, ten years on, 30 percent of his team were dead, and most of the others (himself included) suffered serious health issues. According to Rokke,

verified adverse health effects from personal experience, physicians and from personal reports from individuals with known DU exposures include reactive airway disease, neurological abnormalities, kidney stones and chronic kidney pain, rashes, vision degradation and night vision losses, lymphoma, various forms of skin and organ cancer, neuropsychological disorders, uranium in semen, sexual dysfunction, and birth defects in offspring.²⁵

In addition, there are reports that DU has had terrible consequences for the population in southern Iraq (where much of the DU had been expended in 1991) causing an increase in stillbirths, birth defects, childhood leukaemia and other cancers.²⁶ Furthermore, DU weapons have been blamed for the deaths of sixteen former NATO soldiers involved in the Kosovo campaign.²⁷ Also in Kosovo, around four hundred civilians have allegedly died from cases of leukaemia and other illnesses related to the use of DU ammunition.²⁸ Most recently, in 2003, Australian servicemen and women who served in Operation *Iraqi Freedom* have reported symptoms of uranium sickness.²⁹

The Legality of the Use of DU Weapons under International Humanitarian Law

The use of DU ammunition may violate Article 36 of Additional Protocol I to the Geneva Conventions (AP I) which provides that:

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.

Unfortunately there is no required standard of review. Article 36 only requires that a review be undertaken, but gives no indication as to what constitutes an adequate review. The UK and the US have conducted such reviews, although the scientific standard of those reviews seems questionable because they were conducted by government contractors which lack independence and impartiality. However, what is more important for the purpose of this article is that Article 36 AP I addresses states rather than individuals. Hence, a violation of Article 36 AP I does not give rise to individual criminal responsibility. For these reasons, Article 36 AP I will not be subject to closer examination here.

The Principle of Distinction and the Prohibition of Indiscriminate Attacks

The principle of distinction constitutes an ancient and established rule of customary law and is codified most recently in Article 48 AP I which provides that:

in order to ensure respect for protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives.

Arising out of the principle of distinction is the prohibition against indiscriminate attack, expressed in Article 51 AP I. Article 51 (1) states that 'the civilian population and individual civilians shall enjoy general protection against dangers arising from military operations'. As indicated above, DU weapons have the potential to contaminate areas well beyond the target location. Such contamination also has possible effects on humans. A US Army training manual required, for instance, that anyone who comes within 25 metres of any DU-contaminated equipment or terrain wear respiratory and skin protection, and stated that 'contamination will make

food and water unsafe for consumption'.³⁰ The use of DU ammunition may therefore constitute an indiscriminate attack and violate Articles 51 (4)(c) and 51 (5)(b).

According to Article 51 (4)(c) AP I indiscriminate attacks are:

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 civilians or civilian objects without distinction.

Sub-paragraph (c) is the most important and most controversial provision of this paragraph and, in order to apply it, one must identify the limitations on the effects of attacks as required by the Protocol and define the term 'methods or means of combat'.³¹ As the *travaux préparatoires* of the drafting conference of AP I reveal, it was not intended to mean that there are means or methods of combat whose use would involve an indiscriminate attack in all circumstances.³² Rather, it was intended to take account of the fact that means or methods of combat can be used perfectly legitimately in some situations that could, in other circumstances, have effects that would involve an indiscriminate attack.³³ In other words, 'indiscriminate weapons' in the meaning of sub-paragraph (c) are meant to cover cases where the weapon, even when targeted accurately and functioning correctly, is likely to take on 'a life of its own' and randomly hit combatants or civilians to a significant degree.³⁴ Any evaluation must therefore take into account the nature of the weapons used.

The toxic and radiological dust of DU weapons usually contaminates the immediate vicinity of the rounds' impact, but contamination can also occur beyond this area as the dust can travel with the wind, water or the movement of people and vehicles. Limited use, while conceivable, is highly unlikely since DU is usually employed in weaponry such as anti-tank ammunition, which is mostly used on a larger scale. This assumption is affirmed by the practice in all four conflicts in which DU weapons have been used so far, namely Iraq in 1991 and 2003, Kosovo in 1999 and Afghanistan in 2002.³⁵ In their typical or normal use, DU weapons, even when targeted accurately and functioning correctly, may therefore take on a 'life of their own' and consequently affect combatants or civilians randomly. The effect of DU ammunition is also significant, because it entails a toxicological dose and magnitude of exposure, which cause severe adverse health effects on the civilian population. Large doses can result in heavy metal poisoning, especially if the uranium is in soluble form. However,

even lower doses extended over long periods of time will damage kidneys or, if inhaled, the lungs and become permanently deposited in bone tissue. As a consequence, the use of DU is likely to fall under the prohibition of indiscriminate attacks as specified in Article 51 (4)(c) AP I.

According to Article 51 (5)(b) AP I, an attack is considered indiscriminate if it 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. In contrast to the absolute prohibitions of Paragraphs 4 and 5(a), the prohibition contained in 5(b) is relative, involving a most difficult and ambivalent balancing act between human lives, damage to and destruction of civilian objects on the one hand and a military advantage on the other.³⁶ While in some situations there will be no room for doubt, there may be reason for hesitation in others, particularly due to the fact that the Protocol does not define what is excessive. The decision must be made in accordance with reasonable military assessments and expectations, taking into account potential collateral damage caused to civilians, civilian objects and other protected persons or installations. However, the interests of the civilian population should prevail in case of doubt.³⁷ It is also clear that very high civilian losses and damages may not be justified even if the military advantage at stake is of great importance.

Except when the use of DU weapons results in such very high and extensive civilian losses, injuries and damages, its compatibility with the principle of proportionality cannot be assessed in the abstract but rather depends on a case-by-case assessment in which the mentioned criteria have to be applied. Due to a lack of relevant information about the scale of the use of DU ammunition in the recent war against Iraq, it is — at this stage — impossible to establish whether or not there has been a violation of Article 51 (b)(5) AP I.

The Prohibition of Weapons, Projectiles and Materials of a Nature to Cause Superfluous Injury or Unnecessary Suffering

The prohibition of weapons, projectiles and materials of a nature to cause superfluous injury or unnecessary suffering is a well-established principle, which has been expressed in many treaties in the past.³⁸ Most recently it has been codified in Article 35 (2) AP I which states that ‘it is prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering’. Injuries can only be ‘superfluous’ either if they are not justified by any requirements of military necessity or if the injuries normally caused by the weapon or projectile are

manifestly disproportionate to the military advantage reasonably expected from the use of the weapon.³⁹ The principle calls for a balancing test between the humanitarian concerns (the suffering and injury inflicted) and military necessity. The test is not whether there is a vast amount of injury or suffering, but whether the suffering is needless, superfluous, or manifestly disproportionate to the military advantage reasonably expected from the use of the weapon.⁴⁰ The comparison must to a certain extent be of a subjective character, because the values to be balanced are of a different nature and neither side of the equation is easy to quantify.

It is hard to find objective standards to measure 'injury' and 'suffering'. 'Suffering' poses most difficulties in this regard, because it is more a psychological than an 'objective' medical term. For this reason, the trend has been to focus on 'injury'.⁴¹ Even for 'injury', it is difficult to come up with practicable criteria. One criterion that is used is the incidence of permanent damage or disfigurement.⁴² The more health effects are lasting, the less likely they will be justified by military necessity. A second criterion is the feasibility of treatment under field conditions. This feasibility decreases with the necessity of sophisticated equipment and expertise for the treatment of injuries. It also decreases with the lack of information on the health effects of a particular weapon.⁴³

Whether the use of DU ammunition contravenes the principle depends on the outcome of a balancing test between its adverse health effects on combatants and the military necessity of using this type of ammunition. On the humanitarian side of the equation, it is difficult to quantify the injury and suffering caused by DU due to lack of information. However, as indicated, it has been suggested that DU is partly to be blamed for the 'Gulf War Syndrome', which affected over 90,000 US veterans.⁴⁴ In addition, DU weapons may have been a factor in causing the cancer related deaths of sixteen former NATO soldiers involved in the Kosovo campaign.⁴⁵

As pointed out above, another factor that has to be taken into account in the balancing test is the feasibility of treatment under field conditions. Certainly the possibilities of field treatment have greatly improved since the first formulation of the principle. The purported health effects of the use of DU, however, include notably kidney disease and cancer. These are diseases that require sophisticated equipment and expertise that are unlikely to be available in the field.

On the military necessity side of the equation, it must be noted that DU weapons are principally used as anti-materiel rather than anti-personnel weapons, although there are exceptions. The British government justifies

the use of DU with the argument that ‘no satisfactory alternative material to DU exists to achieve the level of penetration necessary to defeat Main Battle Tanks’.⁴⁶ Other factors will have to be taken into account in determining DU’s military necessity, such as its effectiveness in destroying materiel. A factor that is partly determinative of DU’s military necessity is the availability of alternatives. The use of the metal tungsten appears to be such an alternative for DU. Tungsten has the same density, which is an important element in armour-piercing capacity, as DU, but has not been known to have the same consequences for human health. It was the material of choice in ammunition before the introduction of DU in the US. In 1989 the US Navy switched back to the use of tungsten. The primary reason for the switch was the ‘overwhelming performance advantages’ of tungsten, according to a Navy spokesman.⁴⁷ It is also interesting in this context that whilst DU ammunition was provided with the initial purchase of the Phalanx anti-missile system fitted on some Royal Australian Navy ships in the early 1980s, the DU ammunition was phased out before 1986 and replaced with Australian-developed tungsten tipped ammunition.

In conclusion, a balancing test between adverse health effects on combatants and the military necessity of using DU ammunition tends to shift the balance towards adverse effects on combatants. Severe long-term health consequences, difficult field treatment and the availability of alternatives such as tungsten make it difficult to justify the use of DU as military necessity. DU ammunition can therefore be considered as a weapon of a nature to cause superfluous injury or unnecessary suffering and is likely to breach Article 35 (2) AP I.

The Protection of the Environment

Article 35 (3) AP I specifically prohibits employment of ‘methods or means of warfare which are intended, or may be expected, to cause widespread, long-term, and severe damage to the natural environment.’ Similarly, Article 55 (1) AP I provides that ‘care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage’. Although they use similar language, Articles 35 (3) and 55 (1) AP I have distinct objectives. Article 55, being part of Chapter III of Title IV, is to be viewed in the context of the protection of civilian population and civilian objects. It states a general obligation of care to the natural environment in the conduct of hostilities, but with an ultimate objective of protection of civilians.⁴⁸ Article 35 AP I formulates a basic rule on methods and means of warfare directed at the protection of the environment as such. Both provisions provide ‘an absolute prohibition against severe environmental damage’.⁴⁹ They establish

a limit to environmental damage that can be caused in the conduct of hostilities that cannot be overstepped by resorting to a justification of military necessity.⁵⁰ The infliction of ‘widespread, long-term and severe’ damage is prohibited, whether by direct attack (if it is a military objective) or as collateral damage (if it is a civilian object), even if such damage would be otherwise justified by military necessity or proportionality.⁵¹ Furthermore, the prohibitions of Articles 35 and 55 AP I cover both intentional and unintentional damage.⁵² This is reflected in the formula ‘may be expected to cause’, which ‘inject[s] an element of objective expectation that such damage foreseeably would result from the methods or means employed’.⁵³

Both Articles 35 and 55 establish a threshold of ‘widespread, long-term and severe’ damage to the natural environment. These terms have not been defined, and their meanings remain imprecise.⁵⁴ They are often compared to the terms of the 1976 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD), which uses similar wording but in a different context.⁵⁵ It is generally agreed that the thresholds established by AP I and the ENMOD Convention are not identical and that each should be interpreted in its own context.⁵⁶ It is also generally recognised that – in contrast to the conditions imposed by the ENMOD Convention – the conditions established by Articles 35 and 55 AP I are cumulative, that is, damage has to be ‘widespread, long-term *and* severe’.⁵⁷

As regards the condition of duration, the International Committee of the Red Cross (ICRC) Commentary notes that drafters of AP I had in mind the stability of the ecosystem, although the use of a standard such as ‘the disruption of the stability of the eco-system’ was rejected by the Conference dealing with the *travaux préparatoires*.⁵⁸ The rejection may suggest that the standard as formulated in Articles 35 and 55 AP I is less than the disruption of the stability of the ecosystem. It appears nonetheless from the *travaux préparatoires* that collateral damage from conventional warfare such as artillery bombardment was not intended to be covered and that ‘long-term’ should be understood in terms of decades.⁵⁹

While few indications on the meaning of ‘widespread’ or ‘severe’ can be found in the *travaux préparatoires*, some hints may be found in Articles 54 and 55 AP I. Article 55 AP I refers to the ‘health or survival’ of the population.⁶⁰ According to the ICRC Commentary, the word ‘health’ was used:

to indicate that the provision is concerned not only with acts which jeopardize the survival of the population, but also with

those which could seriously prejudice health, such as congenital defects, degenerations or deformities. Temporary or short-term effects are not taken into account in the prohibitions laid down in this article.⁶¹

Similarly, the 1992 German Military Manual states that:

widespread, long-term and several damage to the natural environment is a major interference with human life or natural resources which considerably exceeds the battlefield damage to be regularly expected in a war.⁶²

In conclusion, it can be said that the use of DU weapons is not unlawful *per se* under Articles 35 and 55 AP I. Nevertheless, given that Uranium 238 has a half-life of 4.5 billion years,⁶³ there is no doubt that the use of DU ammunition meets the 'long-term' condition. The question as to whether 'widespread' and 'severe' damage to the environment occurs is more dependent on the circumstances of each case. It has been asserted that US Army field tests have shown that when a vehicle is struck by a DU bullet, the heaviest contamination occurs within five to seven meters of the vehicle, although DU particles thrown into the air by the rounds impact, or by resultant fires and explosion, can be also carried downwind for many kilometres.⁶⁴ Indeed, in 1991, DU dust from the Gulf war was blown into Kuwait. During the 1999 NATO campaign in Kosovo, a rise in background radiation was noted as far away as Hungary and Northern Greece.⁶⁵ Again, relevant information from the military campaigns in Afghanistan in 2002 and Iraq in 2003 are not yet available. Nevertheless, the history of the Gulf War and NATO operations in Kosovo, if taken to be what 'normal use' of DU ammunition entails, may lead to the conclusion that the environmental damage caused by DU is, in fact, 'widespread, long-term and severe'. As a consequence the use of DU weapons is likely to violate Articles 35 (3) and 55 (1) API.

The Use of Depleted Uranium Weaponry – a War Crime?

It has been submitted that the use of DU ammunition raises serious concerns in relation to a number of rules of international humanitarian law, namely Articles 51 (4)(c), 35 (2), 35 (3) and 55 (1) AP I. Nonetheless, not every violation of international humanitarian law constitutes a war crime. In order for a breach of international humanitarian law to become a war crime, the violation must be 'serious' or 'grave'. Furthermore, it is necessary that the violation be criminalised.⁶⁶ In each case, in addition to proving the *actus reus*, the objective elements of the criminal provision in question, one

has to prove *mens rea*, that is, that the weapon was employed specifically with the intent to cause a particular effect.

As far as AP I is concerned, grave breaches are defined in Article 85. Of particular relevance to the present analysis is Article 85 (3)(b) AP I. According to this provision, 'launching an indiscriminate attack affecting the civilian population or civilian objects in the knowledge that such attack will cause excessive loss of life, injury to civilians or damage to civilian objects' constitutes a grave breach of the Protocol. Indiscriminate attacks are defined and prohibited by Article 51 (4), (5).⁶⁷ As indicated, the use of DU ammunition can be considered as an indiscriminate attack in breach of Article 51 (4)(c). However, for this breach to constitute a war crime the indiscriminate attack must have been launched 'wilfully', that is, the accused must have acted consciously and with intent.⁶⁸ Given the scientific uncertainties in the field of DU ammunition, it is difficult to see how members of the British government or military have authorised the use of DU ammunition acting consciously and with intent to launch an indiscriminate attack.

Breaches of 35 (2), 35 (3) and 55 (1) AP I are not defined as 'grave' in Article 85 (3) AP I. However, as the UK is a party to the ICC Statute, it is sensible to assess violations of the AP I in the light of the ICC Statute, especially as all serious war crimes under AP I and the Hague Conventions are proscribed as war crimes under Article 8 (2)(b) of the ICC Statute. Of particular relevance to the present analysis is Article 8(2)(b)(iv) which defines 'war crime' as:

intentionally launching an attack in the knowledge that such attack will cause incidental loss of life or injury to civilians or damage to civilian objects or widespread, long-term and severe damage to the natural environment which would be clearly excessive in relation to the concrete and direct overall military advantage anticipated.

As Kittichaisare, an expert in international criminal law, notes:

to be guilty of this war crime, the perpetrator must have known, in the sense of making the value judgment that the attack launched by him would cause incidental death or injury to civilians or damage to civilian objects or widespread, long-term and severe damage to the natural environment and that such death, injury or damage would be of such an extent as to be clearly excessive in relation to the concrete and direct overall military advantage anticipated.⁶⁹

An evaluation of that value judgment must be based on the requisite information available to the perpetrator at the time.⁷⁰

The present analysis has revealed that, although the use of DU ammunition is likely to have long-term, widespread and severe implications for the environment, further scientific research is needed to provide definitive answers to the problem. Although evidence from the Gulf War and the NATO campaign in Kosovo suggests that such environmental damage does in fact occur, it is difficult to establish that members of the British government or military 'intended' to achieve these effects by deploying weapons containing DU. In conclusion, it can therefore be said that the authorisation of DU ammunition may in certain cases fulfil the objective elements, the *actus reus* of a crime, as defined in Article 8(2)(b)(iv). The subjective element (*mens rea*) of Article 8(2)(b)(iv), however, cannot be proved.

Conclusion

The use of DU ammunition raises serious concerns in relation to a number of provisions of international humanitarian law of armed conflict. Specifically, it can be argued that in certain circumstances the deployment of DU weapons is likely to violate the prohibition of indiscriminate attacks, the prohibition of weapons causing superfluous injury and the obligation to protect the environment. The scientific uncertainties surrounding the effects of DU on health and the environment, and the fact that weapons containing DU are of relatively recent use, make it difficult to outlaw these weapons in general. Hence, the question as to whether the use of DU is in violation of international humanitarian law of armed conflict has to be answered on a case-by-case basis. The same approach has to be taken to establish whether or not any violation of international humanitarian law also constitutes a war crime. Considering the authorisation of the use of DU ammunition in the recent war against Iraq, it is – at this stage – impossible to characterise the use of DU as a war crime. Even if it can be proved that the deployment of DU weapons in Iraq did in fact violate several rules of international humanitarian law, namely Articles 51 (4)(c), 35 (2), 35 (3) and 55 (1) AP I, it is unlikely that the members of the British government or military acted consciously and with intent and thus committed war crimes.

Notes

- ¹ Richard Galpin, 'Lawyers sue Blair over war', *BBC News* (28 July 2003), available at <http://news.bbc.co.uk/1/hi/world/europe/3101697.stm>. [Accessed 3 November 2004]. Among those accused with Prime Minister Blair were Defence Secretary Geoff Hoon, Foreign Secretary Jack Straw, and Admiral Sir Michael Boyce, who recently retired as Chief of Defence Staff.
- ² Carla del Ponte quoted in 'Use of DU weapons could be war crime', *CNN News* (14 January 2001), available at <http://edition.cnn.com/2001/WORLD/europe/01/14/balkans.uranium/index.html>. [Accessed 3 November 2004].
- ³ The question of whether and to what extent Prime Minister Blair and other members of the British government have immunity from (international) criminal prosecution is not the subject of the present analysis.
- ⁴ Articles 48 (1), 51 (4)(c), 51 (5)(b) AP I.
- ⁵ Article 35 (2) AP I.
- ⁶ Articles 35 (3), 55 (1) AP I.
- ⁷ The question as to whether the ICC has jurisdiction to hear such cases will not be discussed in this paper. However, it seems noteworthy that ICC has already rejected almost forty cases over the war in Iraq. See Barnaby Mason, 'ICC to exclude many cases', *BBC News* (16 July 2003), available at <http://news.bbc.co.uk/1/hi/world/africa/3072095.stm>. [Accessed 3 November 2004].
- ⁸ According to some estimates, 305-340 tons of DU was released in Operation *Desert Storm*. Vladimir S. Zajic, 'Chapter 6: Combat and Accidents', available at <http://members.tripod.com/vzajic/6thchapter.html>. [Accessed 3 November 2004].
- ⁹ In a letter dated 7 February 2000, NATO Secretary General Lord Robertson confirmed to UN Secretary General Kofi Annan the details of DU ammunition use in the 1999 Kosovo campaign. Accordingly, DU rounds were used throughout Kosovo during approximately 100 missions. A total of approximately 31,000 rounds of DU ammunition were used in Operation *Allied Force*, which amounts to a total of approximately 8,400 kg of DU. 'NATO confirms to the UN use of depleted uranium during the Kosovo conflict', United Nations Environment Program (UNEP) Press Release (21 March 2000), available at <http://www.grid.unep.ch/btf/pressreleases/unep21032000.html>. [Accessed 3 November 2004].
- ¹⁰ UNEP, 'Afghanistan: Post-Conflict Environmental Assessment', 2003, available at <http://postconflict.unep.ch/actafghassessment.htm>. [Accessed 3 November 2004].
- ¹¹ 'UNEP Recommends Studies of Depleted Uranium in Iraq', UNEP Press Release (6 April 2003), available at <http://www.unep.org/Documents/Default.asp?DocumentID=309&ArticleID=3952>. [Accessed 3 November 2004].
- ¹² Robert C. Weast (ed), *Handbook of Chemistry & Physics* (Cleveland: CRC Press, 1988) at B-40.

- ¹³ Weast (ed), *Handbook of Chemistry & Physics* at B-40.
- ¹⁴ US Army Environmental Policy Institute, *Health and Environmental Consequences of Depleted Uranium Use in the U.S. Army: Technical Report*, June 1995, at p. 78, quoted in Dan Fahey, 'Depleted Uranium: The Stone Unturned: A Report on Exposures of Persian Gulf War Veterans and Others to Depleted Uranium Contamination', *Swords to Plowshares*, 28 March 1997, available at <http://www.rimbaud.freeserve.co.uk/du01.htm>. [Accessed 3 November 2004].
- ¹⁵ Argonne National Laboratory Environment Assessment Division, *Summary, Fact Sheets for Selected Environmental Contaminants to Support Health Risk Analyses: Depleted Uranium*, at p. 2, available at <http://www.ead.anl.gov/pub/doc/Depleted-Uranium.pdf>. [Accessed 30 January 2005].
- ¹⁶ Argonne National Laboratory Environment Assessment Division, *Summary, Fact Sheets for Selected Environmental Contaminants to Support Health Risk Analyses: Depleted Uranium*, at p. 2.
- ¹⁷ See, for example, Dan Fahey, 'Collateral Damage: How U.S. Troops Were Exposed to Depleted Uranium During the Persian Gulf War', *Metal of Dishonour*, at p. 28, available at <http://www.iacenter.org/depleted/fahey.htm>. [Accessed 3 November 2004]. See also Rosalie Bertell, 'Gulf War Veterans and Depleted Uranium', in *Depleted Uranium: A Post-War Disaster for Environment and Health*, Laka Foundation, May 1991, available at <http://www.antenna.nl/wise/uranium/dhap99f.html>. [Accessed 3 November 2004].
- ¹⁸ M.E. Danesi, *Kinetic Energy Penetrator Long Term Strategy Study*, U.S. Army Armament, Munitions, and Chemical Command, Picatinny Arsenal, NJ, 1990, Appendix D: Vol.1, 4-5; Vol.1, 2-2; Vol.2, 3-4.
- ¹⁹ US Armed Forces Radiobiological Research Institute (AFRRI), Project Briefing, *Health Effects of Depleted Uranium*, 1999, available at http://www.homepage.jefnet.com/gwvrl/afri_briefing.htm. [Accessed 3 November 2004].
- ²⁰ Royal Society, *The Health Hazards of Depleted Uranium Munitions*, March 2002, available at <http://www.royalsoc.ac.uk/du/>. [Accessed 3 November 2004].
- ²¹ Pat Paulsen, 'Depleted Uranium without the Rocket Science,' *Armor*, July-August 1995, p. 34.
- ²² Dan Fahey, 'Depleted Uranium Weapons: Lessons from the 1991 Gulf War,' in *Depleted Uranium: A Post-War Disaster for Environment and Health*, Part 2, Laka Foundation, May 1999, available at <http://www.antenna.nl/wise/uranium/dhap992.html>. [Accessed 3 November 2004].
- ²³ Steve Fetter and Frank von Hippel, 'After the dust settles', *Bulletin of the Atomic Scientists*, vol. 55, no.6, 1999, p. 42.
- ²⁴ A Durakovic, P. Horan, L. Dietz, 'The Quantitative Analysis of Depleted Uranium Isotopes in British, Canadian, and United States Gulf War Veterans', *Military Medicine*, vol. 167, no. 8, 2002, pp. 620-627..
- ²⁵ Neil Mackay, 'US forces' use of depleted uranium weapons is "illegal"', *The Sunday Herald* (Scotland), 30 March 2003.
- ²⁶ Fetter and von Hippel, 'After the dust settles', *Bulletin of the Atomic Scientists*, p. 42.

- ²⁷ Douglas Herbert, 'Caution urged over 'Balkans syndrome'', *CNN News*, 8 January 2001, available at <http://edition.cnn.com/2001/WORLD/europe/01/08/uranium.context/index.html>. [Accessed 3 November 2004].
- ²⁸ Herbert, 'Caution urged over 'Balkans syndrome'', *CNN News*.
- ²⁹ 'Troops show uranium sickness signs, claims expert', *Sydney Morning Herald*, 23 June 2003.
- ³⁰ Cited in Wikipedia, the Free Encyclopedia, Depleted Uranium, available at http://en.wikipedia.org/wiki/Depleted_uranium. [Accessed 20 January 2005].
- ³¹ Michael Bothe, Karl Josef Partsch and Waldemar A Solf, *New Rules for Victims of Armed Conflicts*, (The Hague: Martinus Nijhoff Publishers, 1982) p. 306. The three explicit limitations relating to the protocol are the protection of the natural environment (Articles 35 (3) and 55 AP I), attacks on military objectives located on or near dams, dykes and nuclear electric generating stations, if they cause the release of dangerous forces (Article 56 AP I), and to the rule of proportionality (compare Articles 51 (5)(b) and 57 (2)(a)(ii) and (iii)).
- ³² Yves Sandoz, Christophe Swinarski, Bruno Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions* ((The Hague: Martinus Nijhoff Publishers, 1987) p. 623.
- ³³ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 623.
- ³⁴ Louise Doswald-Beck, 'International humanitarian law and the Advisory Opinion of the International Court of Justice on the legality of the threat or use of nuclear weapons', *International Review of the Red Cross*, no. 316, 1997, pp. 35-55.
- ³⁵ A total of just over 290 metric tons of DU projectiles were fired by the US during the Gulf War (compared to 9 tons in Kosovo and 3 tons in Bosnia and Herzegovina), with DU remaining in the environment as dust or small fragments. The DU munitions were deployed by: the US Air Force A-10 Thunderbolt II ('warthog' or 'tankbuster') aircraft – approximately 81% of the total DU fired; the US Marine Corps AV-8 Harrier aircraft – about 3% of the total; the US Army and Marine Corps M60 and M1A1 Abrams tanks – about 16% of the total. See United Nations Environment Program, *Desk Study on the Environment in Iraq* (2003), at p.68, available at http://www.unep.org/pdf/iraq_ds_lowres.pdf. [Accessed 20 January 2005].
- ³⁶ Leslie C. Green, *The Contemporary Law of Armed Conflict* (Manchester: Manchester University Press, 1993) p. 331.
- ³⁷ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, pp. 625-26, paragraph 1979.
- ³⁸ These include the St Petersburg Declaration of 1868, the Hague Declaration of 1899 containing dum-dum bullets and Article 23(e) of the 1907 Hague Regulation, the 1925 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, and the Biological Weapons Convention of 1972.
- ³⁹ Dieter Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict* (Oxford: Oxford University Press, 1995) at paragraph 402(2).

- ⁴⁰ Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, p. 196.
- ⁴¹ Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict*, at paragraph 408.
- ⁴² Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, p. 196.
- ⁴³ Robin M. Coupland, 'The SirUS Project: Towards a Determination of Which Weapons Cause 'Superfluous Injury or Unnecessary Suffering'', in Helen Durham and Timothy L.H. McCormack (eds), *The Changing Face of Conflict and the Efficacy of International Humanitarian Law* (The Hague: Kluwer, 1999) p. 114.
- ⁴⁴ Fetter and von Hippel, 'After the dust settles', *Bulletin of the Atomic Scientists*, p. 43.
- ⁴⁵ Herbert, 'Caution urged over 'Balkans syndrome'', *CNN News*.
- ⁴⁶ Government Response to the House of Commons Select Committee's Seventh Report – Gulf Veteran's Illnesses, Annex A, available at <http://www.parliament.uk/commons/selcom01/defpnt15.htm>. [Accessed 3 November 2004].
- ⁴⁷ Cited in Scott Peterson, 'Tungsten: One Alternative to a Risky 'Favorite Round'?', *Christian Science Monitor*, 30 April 1999.
- ⁴⁸ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 410.
- ⁴⁹ Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict*, p. 117.
- ⁵⁰ Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict*, p. 117. It is a well established rule that military necessity can only be invoked when a rule explicitly allows it. Military necessity is deemed to have been taken into account when the rules were drafted.
- ⁵¹ Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict*, p. 118.
- ⁵² Fleck (ed), *Handbook on International Humanitarian Law in Armed Conflict*, p. 117.
- ⁵³ Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, p. 345.
- ⁵⁴ Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, pp. 347-348.
- ⁵⁵ The ENMOD Convention prohibits State parties 'to engage in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party.' Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (1977), Article 1.
- ⁵⁶ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 418, paragraph 1456.
- ⁵⁷ Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, p. 346.
- ⁵⁸ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, pp. 416-417, paragraph 1454. In an Understanding of the ENMOD drafting Committee, it has been agreed that, for the purpose of the ENMOD Convention, 'widespread' was meant as encompassing an area of the scale of several hundred square kilometres, 'long-lasting' being for a period of months or approximately a season, and 'severe' being for serious and significant disruption or harm to human life, natural and economic resources or other assets.

- ⁵⁹ Quoted in Bothe, Partsch and Solf, *New Rules for Victims of Armed Conflicts*, p. 346; see also Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 417, paragraph 1454.
- ⁶⁰ The 'survival of the population' is also referred to in Article 54 AP I, which prohibits 'to attack, destroy, remove or render useless objects indispensable to the survival of the civilian population.' Protected objects include 'agricultural areas for the production of foodstuffs, drinking water installations and supplies, and crops, which should be interpreted in the widest sense, in order to cover the infinite variety of needs of populations in all geographical areas'.
- ⁶¹ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, pp. 663-664.
- ⁶² Bundesministerium der Verteidigung (ed), *Humanitäres Völkerrecht in bewaffneten Konflikten – Handbuch*, (Bonn: 1992) p. 37.
- ⁶³ Fetter and von Hippel, 'After the dust settles', *Bulletin of the Atomic Scientists*, p. 42.
- ⁶⁴ See Dan Fahey, 'Collateral Damage: How US Troops Were Exposed to Depleted Uranium During the Persian Gulf War', *Metal of Dishonour*, at 28, available at <http://www.iacenter.org/depleted/fahey.htm>. [Accessed 3 November 2004].
- ⁶⁵ Jo Baker, 'Should war become obsolete?', available at http://www.iraq.be/ned/archief/Depleted%20Uranium_bestanden/DU/JoBaker.htm. [Accessed 3 November 2004].
- ⁶⁶ Antonio Cassese, *International Criminal Law* (Oxford: Oxford University Press, 2003) p. 50.
- ⁶⁷ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 995 paragraph 3477.
- ⁶⁸ Sandoz, Swinarski, and Zimmermann (eds), *Commentary to the Additional Protocols to the Geneva Conventions*, p. 994, paragraph 3474.
- ⁶⁹ Kriangsak Kittichaisare, *International Criminal Law*, (Oxford: Oxford University Press, 2001), p. 164.
- ⁷⁰ Kriangsak Kittichaisare, *International Criminal Law*, p. 164.

BIBLIOGRAPHY

Argonne National Laboratory Environmental Assessment Division, *Summary Fact Sheets for Selected Environmental Contaminants to Support Health Risk Analyses: Depleted Uranium*, available at <http://www.ead.anl.gov/pub/doc/Depleted-Uranium.pdf> [accessed 30 January 2005].

Baker, Jo, 'Should War Become Obsolete?', available at http://www.irak.be/ned/archief/Depleted%20Uranium_bestanden/DU/JoBaker.htm [accessed 3 November 2004].

Bertell, Rosalie, 'Gulf War Veterans and Depleted Uranium', in *Depleted Uranium: A Post-War Disaster for Environment and Health*, Laka Foundation, May 1991, available at <http://www.antenna.nl/wise/uranium/dhap99f.html> [accessed 3 November 2004].

Bothe, Michael, Karl Josef Partsch and Waldemar A Solf, *New Rules for Victims of Armed Conflicts*, (The Hague: Martinus Nijhoff Publishers, 1982).

Cassese, Antonio, *International Criminal Law* (Oxford: Oxford University Press, 2003).

Coupland, Robin M., 'The SirUS Project: Towards a Determination of Which Weapons Cause 'Superfluous Injury or Unnecessary Suffering'', in Durham, Helen and McCormack, Timothy L.H. (eds), *The Changing Face of Conflict and the Efficacy of International Humanitarian Law* (The Hague: Kluwer, 1999) pp. 99-122.

Danesi, Michael E., *Kinetic Energy Penetrator Long Term Strategy Study*, U.S. Army Armament, Munitions, and Chemical Command (Picatinny Arsenal, NJ: 1990).

Doswald-Beck, Louise, 'International humanitarian law and the Advisory Opinion of the International Court of Justice on the legality of the threat or use of nuclear weapons', *International Review of the Red Cross*, no. 316, 1997, pp. 35-55.

Durakovic, A, Horan, P, Dietz, L, 'The Quantitative Analysis of Depleted Uranium Isotopes in British, Canadian, and United States Gulf War Veterans', *Military Medicine*, vol. 167, no. 8, 2002, pp. 620-627.

Fahey, Dan, 'Collateral Damage: How U.S. Troops Were Exposed to Depleted Uranium During the Persian Gulf War,' *Metal of Dishonour*, at p. 28, available at <http://www.iacenter.org/depleted/fahey.htm> [accessed 3 November 2004].

Fahey, Dan, 'Depleted Uranium: The Stone Unturned: A Report on Exposures of Persian Gulf War Veterans and Others to Depleted Uranium Contamination' (28 March 1997), *Swords to Plowshares*, available at <http://www.rimbaud.freemove.co.uk/du01.htm> [accessed 3 November 2004].

Fahey, Dan, 'Depleted Uranium Weapons: Lessons from the 1991 Gulf War,' in *Depleted Uranium: A Post-War Disaster for Environment and Health*, Part 2, Laka Foundation, (May 1999), available at <http://www.antenna.nl/wise/uranium/dhap992.html> [accessed 3 November 2004].

Fetter, Steve, and von Hippel, Frank, 'After the Dust Settles', *Bulletin of the Atomic Scientists*, vol. 55, no.6, 1999, pp. 38-49.

Fleck, Dieter (ed), *Handbook on International Humanitarian Law in Armed Conflict* (Oxford: Oxford University Press, 1995).

Galpin, Richard, 'Lawyers sue Blair over War,' *BBC News* (28 July 2003), available at <http://news.bbc.co.uk/1/hi/world/europe/3101697.stm> [accessed 3 November 2004].

Green, Leslie C., *The Contemporary Law of Armed Conflict* (Manchester: Manchester University Press, 1993).

Herbert, Douglas, 'Caution Urged over 'Balkans syndrome'', *CNN News* (8 January 2001), available at <http://edition.cnn.com/2001/WORLD/europe/01/08/uranium.context/index.html> [accessed 3 November 2004].

Kittichaisare, Kriangsak, *International Criminal Law* (Oxford: Oxford University Press, 2001).

Mackay, Neil, 'US forces' use of depleted uranium weapons is "illegal"', *The Sunday Herald* (Scotland), 30 March 2003.

Mason, Barnaby, 'ICC to Exclude Many Cases,' *BBC News* (16 July 2003), available at <http://news.bbc.co.uk/1/hi/world/africa/3072095.stm> [accessed 3 November 2004].

Paulsen, Pat, 'Depleted Uranium without the Rocket Science,' *Armor*, July-August 1995, pp. 32-36.

Peterson, Scott, 'Tungsten: One Alternative to a Risky 'Favorite Round'?', *Christian Science Monitor*, 30 April 1999.

Royal Society, *The Health Hazards of Depleted Uranium Munitions* (March 2002), available at <http://www.royalsoc.ac.uk/du/> [accessed 3 November 2004].

Sandoz, Yves, Swinarski, Christophe and Zimmermann, Bruno (eds), *Commentary to the Additional Protocols to the Geneva Conventions* ((The Hague: Martinus Nijhoff Publishers, 1987).

United Nations Environment Program, *Desk Study on the Environment in Iraq* (2003), available at http://www.unep.org/pdf/iraq_ds_lowres.pdf [accessed 20 January 2005].

United Nations Environment Program, 'NATO confirms to the UN use of depleted uranium during the Kosovo conflict', UNEP Press Release (21 March 2000), available at <http://www.grid.unep.ch/btf/pressreleases/unep21032000.html> [accessed 3 November 2004].

United Nations Environment Program, 'UNEP Recommends Studies of Depleted Uranium in Iraq', UNEP Press Release (6 April 2003), available at <http://www.unep.org/Documents/Default.asp?DocumentID=309&ArticleID=3952> [accessed 3 November 2004].

United States Armed Forces Radiobiological Research Institute (AFRRI), *Project Briefing, Health Effects of Depleted Uranium*, (1999), available at http://www.homepage.jefnet.com/gwvrl/afri_briefing.htm [accessed 3 November 2004].

Weast, Robert C. (ed), *Handbook of Chemistry & Physics* (Cleveland: CRC Press, 1988).

Wikipedia, the Free Encyclopedia, *Depleted Uranium*, available at http://en.wikipedia.org/wiki/Depleted_uranium [accessed 20 January 2005].

Zajic, Vladimir S., 'Chapter 6: Combat and Accidents', available at <http://members.tripod.com/vzajic/6thchapter.html> [accessed 3 November 2004].

SDSC Publications

Canberra Papers on Strategy and Defence

CP 151	<i>Ballistic Missile Defence for Australia: Policies, Requirements and Options</i> Stephan Frühling	\$22.50
CP 152	<i>ASEAN, Australia and the Management of the Jemaah Islamiyah Threat</i> Bilveer Singh	\$23.00
CP 153	<i>Arming the Singapore Armed Forces: Trends and Implications</i> Bilveer Singh	\$17.50
CP 154	<i>Burma's North Korean Gambit: A Challenge to Regional Security?</i> Andrew Selth	\$16.00
CP 155	<i>Transcending the Cultural Gaps in 21st Century Strategic Analysis and Planning: The Real Revolution in Military Affairs</i> Edwin Lowe	\$17.00
CP 156	<i>Disease Security in Northeast Asia: Biological Weapons and Natural Plagues</i> Christian Enemark	\$23.00

Working Papers on Strategic and Defence Studies

No.	Title	\$8.00 (excl. GST)
WP 388	<i>How the Tatmadaw Talks: The Burmese Army's Radio Systems</i> Desmond Ball	
WP 389	<i>Muslims, Terrorism and Rise of the Hindu Right in India</i> Sandy Gordon	
WP 390*	<i>We Don't Want the Smoking Gun to be a Mushroom Cloud: Intelligence on Iraq's WMD</i> Ron Huisken	
WP 391	<i>Opportunities and Obstacles: Future Australian and New Zealand Cooperation on Defence and Security Issues</i> Gavin Keating	
WP 392	<i>Instability in the US-ROK Alliance: Korean Drift or American Shift?</i> Brendan Taylor	
WP 393	<i>North Korea: Power Play or Buying Butter with Guns?</i> Ron Huisken	

* The price for WP 390 is \$10.00 (excl. GST)

Abstracts of recent SDSC publications and a complete list of publications in print are available through the **SDSC's home page**: <<http://rspas.anu.edu.au/sdsc/>>.

(If you wish to order, please refer overleaf)

SDSC Publications

Quarterly Publications Update

The SDSC provides a 1 page quarterly current publications listing by email. If you wish to receive this listing, please email sdsc@anu.edu.au.

Ordering Information

Abstracts of recent SDSC publications and a complete list of publications in print are available through the SDSC's home page: <<http://rspas.anu.edu.au/sdsc/>>. Ordering is available online or as noted below. A full list of publications will be sent out on request.

- Either one-off or standing orders are accepted.
- The cost of packaging and postage by surface mail is included in all book prices.
- Credit cards welcome (Bankcard/Mastercard/Visa/American Express).

Method of Payment

- *Customers within Australia:* cheque, money order or credit card.
(**Note:** GST is payable on books within Australia.)
- *Overseas Customers:* bank draft (in Australian dollars) or credit card.
- **All cheques and bank drafts are payable to Australian National University.**

(simply complete, cut out and fax or post the following form)

 TO: Publications Sales * = voluntary information
 Strategic and Defence Studies Centre
 HC Coombs Building # 9, Fellows Road
 Australian National University
 Canberra ACT 0200 Australia
 Fax: + 61 (0)2 6125 9926; E-mail: sdsc@anu.edu.au

I would like to receive the following *SDSC Publications*:

___ copies of Canberra Paper No. ___ / ___ copies of Canberra Paper No. ___

___ copies of Working Paper No. ___ / ___ copies of Working Paper No. ___

Name: _____

Address: _____

*Fax no: _____ *E-mail: _____

Please find enclosed (*Australian dollars*): cheque / money order / bank draft

 Credit Card no.: _____

Name on Credit Card: _____

Credit Card Type: _____ Expiry date: _____