MANAGING ACCEPTABILITY

UK policy on depleted uranium weapons

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Front cover This tank which lies in the middle of a heavily populated residential area bears the scars of a DU strike. It is contaminated with chemically toxic and radioactive dust and will remain there for months. Credit: Naomi Toyoda, April 2003, Mahamdiya, Iraq.

Back cover (Picture above) US soldier in Baghdad, a capital city repeatedly strafed by 30mm DU rounds from A10 Warthog aircraft. The GAU-8 Avenger cannon mounted on the aircraft can fire 3,900 rounds per minute. Credit: Naomi Toyoda, April 2003, Baghdad, Iraq. (Picture below) A women looks on uneasily as her husband is searched in front of a US M1A1 Abrams Tank at a US checkpoint. The Abrams is armed with a 120mm cannon that fires a range of DU ammunition. Credit: Naomi Toyoda, April 2003, Baghdad, Iraq.

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ACRONYMS

AEA	Atomic Energy Authority
AFRRI	US Armed Forces Radiobiology Research Institute
APFSDS	Armour Piercing, Fin Stabilised, Discarding Sabot
CCW	The United Nations Convention on Certain Conventional Weapons
CF	Coalition Forces
DfID	Department for International Development
DoD	US Department of Defence
Dstl	Defence Science and Technology Laboratory
DU	Depleted uranium
DUIRB	Depleted Uranium Independent Review Board
DUOB	Depleted Uranium Oversight Board
FCO	Foreign and Commonwealth Office
FoI	Freedom of Information request
FRG	Federal Republic of Germany
GWI	Gulf War Illness
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer
ICBUW	International Coalition to Ban Uranium Weapons
IHL	International Humanitarian Law
KE	Kinetic energy
KCMHR	King's Centre for Military Health Research
MAFF	Ministry of Agriculture, Fisheries and Food
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
NERC	Natural Environment Research Council
NRPB	National Radiological Protection Board
R&D	Research and Development
RARDE	Royal Armament Research and Development Establishment
SCHER	European Commission Scientific Committee on Health and Environmental Risks
SEDE	European Parliament Subcommittee on Security and Defence
SSO	Safety Services Organisation
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
US	United States
USAF	United States Air Force
WHO	World Health Organisation

EXECUTIVE SUMMARY AND RECOMMENDATIONS

INTRODUCTION

Depleted uranium (DU) is used in armour piercing tank shells and bullets because of its high density and because it burns upon impact. The use of DU munitions results in the uncontrolled release of chemically toxic and radioactive particles of respirable size and can lead to the contamination of soils, infrastructure and groundwater; DU particles are carcinogenic and genotoxic.

In Iraq and the Balkans, numerous reports from medical staff have noted rising rates of cancer and birth defects. Though these may be linked with the use of DU weapons, to date there have not been any large scale epidemiological studies on exposed civilian populations that can confirm this. Countries that use these weapons claim that this lack of evidence means that DU does not pose a significant risk to human health.

This report argues that the Ministry of Defence (MoD) has been aware of the intrinsic public unacceptability of DU weapons since their initial development in the Cold War. In order to overcome this, the MoD has consistently sought to manage the public and political debate over the weapons, a process which continues to the present day.

The MoD developed DU munitions on the basis of a perceived military need and continues to stubbornly defend their use, largely on the basis of the difficulties they face in replacing them. In spite of a growing understanding of their potential humanitarian impact and increasing international pressure for a ban on their use, the MoD has stuck to what amounts to a public relations campaign to deflect public and parliamentary scrutiny.

The MoD's strategy raises issues of both democratic accountability and institutional transparency; it has also necessitated the politicisation of scientific research and the active dismissal of the concerns of civil society and parliamentarians. While this report focuses on DU munitions, the lessons drawn from its analysis of the MoD's behaviour have wider implications for the MoD's accountability.

POLITICS OF EARLY DU RESEARCH & DEVELOPMENT

DU munitions were researched and developed in the Cold War era between the 1960s and 1980s. Throughout

this period it is clear that DU was seen as contentious by cabinet ministers and the public.

Issues of contamination and the health hazards posed by inhaling DU dust were brought forward by safety officials and early consideration of these issues was requested. This request was deferred until after DU's military utility was assessed. When a percieved advantage became apparent during trials between 1975-6, MoD staff focused on managing the concerns around DU rather than assessing the risk they posed to civilians and personnel. This tactic of managing public and political acceptability ensured that the proposals for DU development in the UK were accepted.

The MoD's strategy for controlling the terms of the debate developed during this period – selective openness, managing the framing of DU's hazards and undermining public opposition – formed the basis for the UK's policy on DU. The policy paid little regard to the effect that their weaponry might have on veterans, civilian populations, and the environment in post-conflict states.

DU USED IN THE GULF WAR

The Gulf War (1990-1991) marked the first significant use of DU munitions by the US and UK in a conflict. On returning from the Gulf, a number of veterans subsequently reported a range of illnesses and, as concern grew, questions were raised over the use of DU weapons.

The MoD's attitude toward public concerns over DU at this time was one of denial and non-engagement. Despite indications to the contrary, it was claimed that no evidence showed DU to pose a health or environmental risk. This claim was made even as the MoD stated that no further research would be commissioned and in the knowledge that very little research had yet been done.

DU was framed by the MoD as innocuous, effective and necessary to protect UK troops. The need and performance of DU weapons was overstated which, alongside a troop protection narrative was used to distract from DU's humanitarian consequences. No attempts were made to take responsibility for contamination - despite calls from Iraq and Kuwait and warnings from the UK's adviser on nuclear safety.

DU USED IN THE BALKANS

The controversy over DU grew considerably in the late 1990s during the Balkan conflicts. As a result, the United Nations Environment Programme (UNEP), the World Health Organisation (WHO), the UK Royal Society and the MoD conducted their own research programmes.

Though well conducted, this research encountered a number of limiting factors: a lack of data (for example on civilian and troop exposure), a lack of US firing coordinates - which prevented the majority of DU sites in Iraq from being assessed for contamination, the collapse of institutions in affected states and the impact of a lack of funding and the volatile security situation on fieldwork.

International organisations broadly concluded that DU did not present as large a risk as the media had presented. However, DU contamination had been identified in hotspots around targeted sites, and DU had been found in drinking water in Bosnia and Herzegovina.

UNEP, WHO and the Royal Society made recommendations for the long term monitoring of the environment, clean up and decontamination of polluted sites and awareness raising among local populations. In addition to this in 2010, citing scientific uncertainty over the long term environmental impact of DU contamination, UNEP called for a precautionary approach to the use of DU.

The MoD responded by taking up some of these recommendations, though the extent of this remains severely limited. The MoD has cherry picked research outcomes that maintained a view of DU as acceptable, whilst failing to adequately acknowledge uncertainty and appropriately fulfil the recommendations of expert bodies.

The underlying policy that DU weapons will be used and their acceptability managed remained largely unchanged, in spite of a growing body of scientific evidence that highlighted uncertainty and recommended precaution.

DU USED IN THE INVASION OF IRAQ

The decision by US led Coalition Forces (CF) to invade Iraq in 2003 was met with massive domestic opposition and renewed scrutiny over the use of DU. In response the MoD publicly stated that they had a 'moral obligation' for the post-conflict clean up of DU in Iraq.

The stated 'moral obligation' for clean-up ultimately comprised of: the removal of eight military vehicles, an undisclosed quantity of surface-lying DU fragments as part of standard ordnance clearance work, and the dissemination of generic information warning Iraqis to stay away from battlefield debris.

Funding was made available via the Department for International Development (DfID) for a UNEP-run capacity building programme to train Iraqis to assess DU contamination. To help facilitate this, the UK released its DU firing coordinates to UNEP, although the US did not.

On examination, the MoD's clean-up efforts were not sufficient to the task at hand. The removal of eight vehicles remains a token gesture given the extent of contamination that the 1,900 kgs of DU fired by the UK would have caused. Iraqis were not given any DU-specific hazard awareness information, and UNEP's programme was severely hampered by lack of funding, the refusal of the US to release its firing coordinates and the lamentable security situation.

The MoD's announcement of a 'moral obligation' for clean up has been shown to be a façade, enabling the MoD to maintain an air of respectability and political support for the controversial weapon.

DU POLITICS POST 2003

Two themes that have influenced the developing politics of DU since 2003 are explored here: the MoD's own research programme and the resurgence of international pressure for a ban on the weapons. This section will also review the UK's current policy on DU weapons.

MoD DU research programme

Following public pressure, the MoD instigated a major DU research programme. The programme was monitored by an independent review board and though commendable for furthering research on DU's environmental behaviour, was heavily skewed. Only one of the 12 research areas focused on the health effects of DU.

The programme revealed a number of knowledge gaps and, as was noted by the review board, this research should have been done prior to the weapons entering service and certainly before they were used.

Significantly, the research programme also marked the beginning of research into less toxic alternatives to DU weapons. This shift was a tacit acceptance that radioactive and chemically toxic conventional weapons are unacceptable.

International concern

While previously driven primarily by media coverage of DU's use in conflict, sustained pressure is now being applied through civil society initiatives in cooperation with states and parliamentarians.

Since 2001, DU weapons have been the focus of three UN General Assembly resolutions (2007, 2008, 2010), four resolutions in the European Parliament (2001, 2003, 2006, 2008), a resolution in the Latin American Parliament (2009), and the subject of domestic bans in Costa Rica (2011) and Belgium (2007).

An outcome of the political attention in Europe has driven a tactical shift in the language the MoD now use to justify DU's acceptability. A new risk/hazard discourse has emerged which acknowledges DU's hazardous nature but notes that the likelihood of exposure to DU is low and thus the risk is non-existent. This assumption is based on the results of troop exposure studies. There remains no data on levels of civilian exposure, whose long term exposure scenarios are different to those of military personnel.

Current position

The UK is in a problematic procurement '*impasse*' thanks to short-sighted development decisions dating back to the 1960s. Export options for the UK's only DU round, CHARM3, are limited and the round is no longer manufactured.

Investigation into an upgrade has revealed that a tungsten round combined with a German smoothbore gun barrel is more effective than the current CHARM3 round, however for reasons of cost and the toxicity of the tungsten round, replacement plans have been shelved. The MoD response to the toxicity of tungsten is another acknowledgement of the problematic nature of chemically toxic conventional weapons.

The MoD continues to maintain poorly supported arguments of 'the MoD does not recognise there is

a risk to health and the environment from the use of DU ammunition' to deflect public and parliamentary opposition to a highly controversial weapon, which the MoD needs to fulfil a perceived capability requirement. By refusing to recognise the potential risks from DU weapons, the UK government is also able to evade responsibility for costly decontamination and the potential humanitarian impact of the weapons.

CONCLUSION

The UK's use of DU weapons has raised several key issues:

The MoD's negligent attitude toward humanitarian concerns

During the 1970s, the MoD's attitude sidelined concerns from safety officials to gain approval for the development of a weapon they perceived as necessary. Only after heightened public concern did the MoD make efforts to investigate the impact of DU weapons. Significantly, the issue of civilian exposure to DU remains under-researched. As was noted in 1971 and again in 2007 the health and environmental consequence of DU weapons should have been considered prior to their development and use.

The limited extent of the UK's post-conflict obligations

The official government line has remained throughout that post-conflict remediation work is the responsibility of the affected state. The public outcry that arose around DU's use during the Iraq invasion in 2003 forced the MoD to recognise a 'moral obligation' for clean-up. However in practice the UK failed to sufficiently fulfil this obligation. International and domestic organisations' recommendations for post conflict clean up, hazard awareness and environmental monitoring are yet to be implemented. At issue is state responsibility for the post-conflict management of toxic remnants of war and whether the domestic environmental norms that apply to parties to a conflict during peacetime, such as the polluter pays principle, should apply after conflict.

The MoD's 'transparent' public relations strategy

Since 1979, the MoD has attempted to manage the public and ministerial perception of DU with an aggressive public relations strategy. Public statements during the 1970s downplayed DU's hazards and avoided the key issue of the hazardous dust generated by DU use, despite acknowledging in private that DU would not be fired in training due to health and environmental concerns.

The 1990s blanket dismissal of the risks changed during the early 2000s and was followed by a strategy of 'selective transparency and openness' after numerous reports highlighted that DU was problematic. The current justification for DU use now utilises scientific uncertainty as a justification for inaction. This new discourse, which recognises that DU is a hazard, but argues that there is insufficient evidence of risk is at odds with UK and EU environmental protection norms. Calls from UNEP which have cited scientific uncertainty as justification for a precautionary approach continue to be ignored.

MoD influence highlights a democratic deficit

The MoD has a vested interest in ensuring the ongoing use of DU munitions. In the debate over their acceptability they have sought, and still maintain, a highly influential role in the framing of UK DU policy. But is this morally acceptable? To what extent should the MoD's interests be balanced with humanitarian and environmental considerations and what mechanisms are in place to ensure that the policy shaped by the MoD is properly scrutinised?

The MoD's current and historical strategy suggests that DU munitions are intrinsically unacceptable to the British public. Similarly their use clearly runs counter to our domestic environmental and health protection norms. Yet on this issue the MoD remains largely unaccountable, both to parliamentary and civil society scrutiny.

The use of DU weapons has raised questions of moral and political acceptability; questions that those with a vested interest are poorly placed to answer. A formalised mechanism through which humanitarian and environmental concerns over new weapons technologies can be raised and scrutinised as a counterbalance to military interests is urgently required.

This is an issue that is wider than the question of DU weapons; it relates to the numerous controversial weapons and military strategies that the UK Armed Forces employ. This must be addressed by government and civil society.

RECOMMENDATIONS

It is pertinent that the UK government:

1. **Accelerate efforts to remove DU munitions from the UK's arsenal.**

   The UK should take the opportunity to display international leadership and set a date for the removal of CHARM3 from its arsenal. It should accept that DU's use runs counter to civilian and environmental protection norms and has no place in contemporary conflict.

2. **Assess the potential humanitarian and environmental impact of toxic munition components.**

   This should begin at the earliest stage of development or during procurement and remain an ongoing requirement throughout the lifespan of the weapons. Assessments should be undertaken in a transparent manner to facilitate the input from academia and independent experts. Where components are found to be potentially hazardous, steps should be taken to identify less toxic alternatives.

3. **Extend its precautionary approach to encompass civilian risk reduction and decontamination.**

   The MoD should seek to bridge the gulf between the precautionary approach it takes to the protection of its own troops and the management of DU contamination on its own properties and its obligations for assisting communities affected by the use of DU weapons.

4. **Reassess its approach to managing scientific uncertainty.**

   Domestic environmental and health protection norms stemming from UK and EU environmental law uphold the precautionary approach which entails that due care and attention should be taken in the face of scientific uncertainties. The MoD must pay heed to this principle in considering the effect of its weaponry on civilian health and the environment during conflict. The claimed utility of munitions should not be employed by the MoD as a means of overruling this principle.

5. **Create formalised mechanisms to provide greater scrutiny over MoD weapons policy.**

   Increasing focus on inhumane, indiscriminate and controversial weapons during the last two decades has underlined the need for more balanced debate over how the MoD chooses its methods and means of warfare. New technologies such as drones and autonomous robots will again test the responsiveness of the MoD to humanitarian concerns, even as criticism grows of the lack of scrutiny over MoD policy for the assessment of the legality of new weapons. Parliament and civil society should have a stronger, more formalised role in these debates in order to add a democratic counterbalance to the interests of the MoD.

INTRODUCTION

DU is a by-product of the process used to enrich uranium to make nuclear weapons or fuel for power stations. Because of its high density, its ability to self sharpen as it comes into contact with hard targets and because it burns upon impact[1], it is used in armour piercing tank shells and bullets – a class of weapons called kinetic energy (KE) penetrators. The uranium is used in a dart at the core of the weapon.

The use of DU munitions results in the uncontrolled release of chemically toxic and radioactive particles of respirable size and can lead to the contamination of soils, infrastructure and groundwater. In vitro and in vivo studies, many undertaken by the US Armed Forces Radiobiology Research Institute (AFRRI) have shown that DU is genotoxic. This means that DU can damage the genetic material in cells, causing mutations and increasing the risk of cancer. The WHO's specialist agency on cancer, the International Agency for Research on Cancer (IARC), has classed all alpha particle emitting radionuclides, of which DU is one, as Class I human carcinogens when inside the human body[2].

In Iraq and the Balkans where uranium weapons have been used, numerous reports from medical staff have noted rising rates of cancer and birth defects, which may be linked with the use of uranium weapons. However, due to a lack of funding, the complex security situation and crucially, a lack of transparency from the users of the weapons, there have not been any large scale epidemiological studies on exposed civilian populations. The countries that use these weapons claim that this lack of evidence means that DU does not pose a significant risk to human health.

These controversial weapons were developed by the UK between the 1960s and 1980s. Papers held by the UK National Archives document this period and have been used as a primary source for the first section of this report. The papers show that early trials revealed that the contamination caused by DU could be a significant problem. They also show that the MoD was acutely aware of the intrinsic public unacceptability of these weapons from the outset.

In spite of these problems, the MoD perceived the weapon to be essential within the context of the Cold

1. The ability of DU weapons to burn when impacting a hard target is referred to as its pyrophoric effect.
2. El Ghissassi, F. et al. (2009) A review of human carcinogens–part D: radiation. The Lancet Oncology, 10(8), p.751–752

War and thus sought to manage the debate on DU to ensure approval for its development in the UK. The need to manage the acceptability of DU in the face of concerns from Parliament and the public continues to this day and is a trend that runs throughout the MoD's behaviour and discourse on the weapons.

DU munitions have been used by the UK and US over the last two decades in three conflicts; approximately 286,233kg of DU was fired during the Gulf War[3] (1991), at least 6,994kg during the Balkans conflicts[4] (1994, 1995, 1999) and it is estimated that at least 140,000kg was used during the Iraq Invasion[5] (2003), however definitive figures on the quantity fired are unavailable. It is also suspected that the US has used DU in Afghanistan since 2001, although the US has denied this[6]. After each conflict in which it has been confirmed that DU munitions have been used, public concern and controversy has ensued.

After the Gulf War in 1991, the issue of Gulf War Illness (GWI) became a significant concern amongst veterans in the UK, US and Canada. This concern and its potential connection to DU rapidly brought DU to the fore in Anglo-American politics.

Towards the end of the Balkans conflict, following the discovery by researchers based in Serbia that DU munitions had been used by the US, media interest grew significantly. This increased global profile caught the attention of Kofi Annan, the then Secretary General of the UN, who mandated UNEP to investigate. This sparked off an increase in institutional interest in DU as the British Royal Society and WHO began to investigate and comment on the potential health and environmental risks from DU munitions. This attention prompted the MoD to instigate its own research programme in the early 2000s.

By 2003, whilst DU munitions were being used during the invasion of Iraq by CF, DU was already a highly controversial subject. Due to the mass unpopularity of the Iraq War and increased information on DU, pressure mounted for the UK to take responsibility for decontamination and undertake research on DU's environmental and humanitarian impact.

It was after this conflict that international bodies such as the European Parliament, the Latin American Parliament and the UN took an interest. A number of resolutions have been passed that accept DU's potential risks, call for greater transparency over its use, for more research in affected states and regional moratoria.

Throughout the last two decades, in spite of growing opposition to DU, the MoD has doggedly maintained its 1970s attitude toward DU politics. Policy on DU has remained unchanged with the bottom-line being that:

> *"The Government's policy remains that DU can be used within weapons; it is not prohibited under current or likely future international agreements. UK Armed Forces use DU munitions in accordance with international humanitarian law. It would be quite wrong to deny our serving personnel a legitimate and effective capability."*[7]
>
> **Lord Astor of Hever, Under Secretary of State and the Lords Spokesman on Defence**

This policy has been adhered to in spite of an understanding that DU weapons pose health hazards and leave a legacy of uncontrolled contamination. In order to maintain the political will to continue using these controversial weapons the MoD has consistently sought to manage the politics of DU's acceptability.

3. Fahey, D. (2003) Science or Science Fiction? Facts, Myths and Propaganda In the Debate Over Depleted Uranium Weapons, p. 13.

4. International Coalition to Ban Uranium Weapons (2011) A Question of Responsibility: depleted uranium weapons in the Balkans [Available at: http://www.bandepleteduranium.org/en/a-question-of-responsibility-the-legacy-of-deplete, last accessed on: 1 Sep 2012] only the US Armed Forces used DU munitions in the Balkan conflicts.

5. Please see http://www.bandepleteduranium.org/en/overview#3, last accessed on: 1 Sep 2012.

6. Ibid.

7. Astor, J. House of Lords Hansard London: HMSO HL Deb 26 Apr 2011: Column WA6.

POLITICS OF EARLY DU RESEARCH AND DEVELOPMENT

"Whilst sponsoring this work [research into uranium based alloys for KE penetrators] *RARDE is conscious of a number of issues, some political, which it felt needs early Headquarters consideration, and preferably resolution, before effort and finance can be deployed other than on a research programme....*

"....Uranium dust if ingested has toxic properties; will this be politically acceptable?

"...there is a significant level of radioactivity in the area of a plate struck by uranium shot... again we would enquire whether this property in a Service shot is likely to be acceptable politically."[8]

Deputy Director, RARDE, 26 July 1971

DU weapons were developed during the Cold War, in an era in which the threat of a Soviet tank invasion, and close political and defence ties to countries within the North Atlantic Treaty Organisation (NATO) strongly informed MoD procurement policy. During this period the US, France, West Germany and Russia were also developing or considering developing DU munitions.

In the UK, DU's potential as an anti-tank round was first researched in the early 1960s, with trials taking place in Eskmeals, Cumbria in 1962[9]. However, in 1964 and due to Foreign and Commonwealth Office (FCO) concerns over the UK's obligations around the development of atomic weapons, it was felt that only limited enclosed trials could take place[10]. In 1979, a decision was taken to further pursue research into DU through an open range firing programme. This decision, and the politics that surrounded it, will be the focus of this section.

UK government correspondence dating from between 1968 and 1980 and held by The National Archives was analysed. These documents include confidential discussions between various government bodies and individuals including; the MoD, the Ministry of Agriculture, Fisheries and Food (MAFF), the Department of the Environment, the Secretary of State for Energy, the Scottish Office, the FCO, the Royal Armament Research and Development Establishment (RARDE), the Safety Services Organisation (SSO), the US Embassy and the Prime Minister's Office.

What is clear throughout this first period is that the political acceptability of a weapon that is capable of generating significant hotspots of contamination is questioned from the outset. When it becomes clear that DU weapons will be developed, the question of acceptability becomes a matter of managing the debate, rather than acknowledging and responding to the risk that the weapons pose.

8. Deputy Director, RARDE, (1971) FCR/230/012, Uranium based alloys for KE penetrators, 26 Jul 1971, in 120mm APDS ammunition for Chieftain: use of depleted uranium for cores, WO 32/21469, The National Archives (TNA).

9. Delamain, CJG (1974) Joint Firing Trials, D/DGW(A)/11/2/42/Wpns 2a, 25 Jun 1974 in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

10. MoD (1977) Draft minute to Secretary of State, Research Firing of Depleted Uranium in the UK D/ER2/14/16, 10 Feb 1977 in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

Early trials

The early trials that took place during the 1960s and early 1970s revealed a number of problematic issues. Documents from the 1962 and 1963 trials at the Eskmeals range in Cumbria[11] highlight:

> *"...the amount of decontamination required after each trial, and the risk of gradual accumulation of serious contamination problems in the surrounding rooms and in the backwall."*[12]

As a result, in 1963 a special butt was constructed to accommodate the trials. This proved problematic as it tended to catch fire due to the pyrophoric nature of DU[13]. In 1968 the risk from the ingestion of uranium dust[14] is also identified as a problematic issue.

POLITICAL PROBLEMS 'DEFERRED'

The most interesting of these early documents is a note written in 1971 by the Deputy Director of RARDE, who highlights that:

> *"Whilst sponsoring this work* [research into uranium based alloys for KE penetrators] *RARDE is conscious of a number of issues, some political, which it felt needs early headquarters consideration, and preferably resolution, before effort and finance can be deployed other than on a research programme."*[15]

The 'issues' highlighted are;

> *"(ii) In firing uranium rounds offensively into vehicles;*
>
> *(a) Uranium dust if ingested has toxic properties; will this be politically acceptable? This is not a casual query; we have earlier been unable to get political clearance for a CS filled 31 mm AP round for attacking the occupants of APCs (although a red phosphorus (smoke) filling was accepted).*
>
> *(b) there is a significant level of radioactivity in the area of a plate struck by uranium shot, sufficient, in our experience, to necessitate special handling techniques on the range for the contaminated plate, and again we would enquire whether this property in a Service shot is likely to be acceptable politically."*[16]

In response to this report, and in reference to the so called 'political question', BH Newman, Assistant Director of Weapons notes that:

> *"Personally, I don't think it worthwhile pursuing this* [DU weapons] *(beyond research) unless there is a very big advantage (say pyrophoricity) in the application to small calibre ammunition... My advice therefore is to express interest in the research and defer the 'political' question until we know whether it is worth pursuing."*[17]

This correspondence highlights that the MoD was aware of serious questions surrounding the political acceptability of DU weapons but deferred them in order to assess whether DU use in weapons could be militarily advantageous.

Research over the next few years continued to report contentious issues. In 1973 WSN Tinkler of the SSO notes that;

> *"The butt and surrounding area will be contaminated by the very persistent dust. It will probably be impossible to remove this completely and* ***initial consideration of this fact is essential***[18]***."***[19]

11. Delamain, CJG (1974) Joint Firing Trials, D/DGW(A)/11/2/42/Wpns 2a, 25 Jun 1974 in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

12. Watson, Directorate of Safety Services, (1962) 9 Jul 1962, in Delamain, CJG (1974) Joint Firing Trials, D/DGW(A)/11/2/42/Wpns 2a, 25 Jun 1974, in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

13. Ibid.

14. War Office (1968) APDS with uranium pads, 30 Jan 1968, A/70/AMM AFV/27 in 120mm APDS ammunition for Chieftain: use of depleted uranium for cores, WO 32/21469, The National Archives (TNA).

15. Deputy Director, RARDE, (1971) FCR/230/012, Uranium based alloys for KE penetrators, 26 Jul 1971, in 120mm APDS ammunition for Chieftain: use of depleted uranium for cores, WO 32/21469, The National Archives (TNA).

16. Ibid.

17. BH Newman Memo Assistant Director of Weapons (A)a (1971) Memorandum, 3 Aug 1971, in120mm APDS ammunition for Chieftain: use of depleted uranium for cores, WO 32/21469, The National Archives (TNA).

18. Highlighted by the author.

Again in 1973, as the Deputy Director of RARDE highlighted in 1971, early consideration of the problematic nature of DU use in weapons is recommended by safety officials and RARDE. Uranium dust inhalation was again identified as a hazard in 1973[20]. In 1974, in reference to proposed test firings into the Solway Firth from the cliff top range at Dundrennan, Dumfries and Galloway, Mr Bowman of the SSO notes:

> *"It is unlikely the "losing" of the projectiles in this way would be considered an approved method* [of disposal]."[21]

Bowman also brings to attention that this practice could be contrary to the 1972 Oslo Convention[22] and that approval from MAFF should be sought, given that non-recovered projectiles may be a threat to fishermen in the area.

Evidently the MoD has been aware of the difficulty of decontamination and the hazard that toxic uranium dust presented since the early 1970s. Consideration of these issues, though realised at this early stage, were 'deferred' until further research suggested that DU might bestow a military advantage. These problems, highlighted more than 40 years ago remain central to the debate over the acceptability of DU weapons today.

The MoD establish a 'need' for DU

TRILATERAL TRIALS

During the mid 1970s the US, UK and the former Federal Republic of Germany (FRG) conducted a series of trilateral trials to compare developments in tank guns and armour-piercing munitions. One important aspect of these trials was an attempt to win American favour for a British-designed rifled gun barrel over a competing German smoothbore design[23]; the other was to compare ammunition types.

It is within this context that the matter of DU ammunition is raised. During 1976 trials at the Aberdeen Proving Ground (US) the American 105mm DU round was shown to outperform the UK and FRG's 120mm tungsten ammunition. This left a strong impression on staff within the MoD, and it was at this point that the development of DU rounds on open firing ranges in the UK was petitioned for:

> *"American experience with DU ammunition has demonstrated the high penetration effectiveness of its high density core. It is therefore, proposed to address a separate minute to you asking you to review our present position not to experiment with DU ammunition on open ranges in the UK."*[24]

Following the trials, it was also argued that DU was needed to defeat the latest developments in Soviet armour:

> *"The impetus to proceed with development, including trials on open MoD ranges, stems from... a need to find a counter to advanced armour protection such as Chobham armour, on the assumption that the Warsaw Pact will acquire these technologies sooner or later."*[25]

Another influential factor was the imperative to protect the UK's position as a leading arms exporter. During this

19. WSN Tinkler, Safety 2 (FE) (1973) Use of uranium for projectile cores, D/Safety/15/52, 23 Feb 1973, in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

20. F Bowman, Chief Safety Officer, Safety Services Organisation (1973) Uranium for projectile cores D/Safety/15/6&52, 18 Feb 1973, in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

21. F Bowman, Safely Services Organisation (1974) Hazards of DU, D/DGW(A)/11/2/42/Wpns, 5 Aug 1974,in Proposals for open range firing of depleted uranium ammunitions, and its storage in the UK, DEFE 70/721, The National Archives (TNA).

22. The 1972 Oslo Convention refers to the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft. This was an international agreement designed to control the dumping of harmful substances from ships and aircraft into the sea. It was adopted on the 15th February 1972 in Oslo, Norway and came into force on 7th April 1974.

23. CSA to S of S, (1977) Future Tank Gun, CSA/224/77/5/3/2, 11 May 1977, in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA)

24. MGO (1977) Future Tank Main Armament, Current position and proposed actions, D/MGO Sec/99/1/1, 16 Feb 1977 in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA).

25. Anonymous to Secretary of State, (no date) Depleted Uranium for tank armour penetration, D/min/jg/5/3 in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA).

period the UK's NATO partner the US, and France were already conducting open firing trials[26] and, in the case of the US, already producing DU ammunition. The UK did not want to find itself 'left out in the cold'[27]:

> *"Unless we remain abreast of technological advances in the ammunition field, we could find ourselves isolated with our markets taken over by the US."*[28]

These exchanges in early 1977 demonstrate that the trilateral trials and performance of the American DU round, concern over the Warsaw Pact, the protection of the British arms export market, the promotion of the British rifled gun barrel and a need to keep on top of the latest technological advances were all important motivating factors for the MoD in establishing a need for DU. With this need established, it became clear that the MoD intended to develop DU rounds, yet the issue of political acceptability remained:

> *"An alternative possibility would be to hold* [open air] *trials in the US, where it is no secret from the American public that trials take place. This would avoid any misguided public protest at DU firings in this country but would be much more expensive and time consuming, and mean that all we did was known to the Americans. Trials in the US are not recommended but would appear preferable to carrying out no UK tests at all."*[29]

To follow the preferred option and develop DU in the UK an agreement for an open range firing programme would have to be reached and the political problems overcome.

It is worth noting here that of the three countries involved in these trials, West Germany decided not to develop DU muntions due to the anticipated public opposition[30].

THE 'POLITICAL PROBLEMS'

During 1977, the MoD was eager to develop DU and undertake open air testing on UK firing ranges, but the 'political problems' remained. The practical problem of toxic dust was accompanied by the issue of public concern over weapons containing nuclear material. The labelling of public concern as 'emotive' is interesting and will be discussed further in the next section.

This anticipation of public concern over DU is unsurprising. The late 1970s were a period in which concern over nuclear power and weapons development was particularly acute. In correspondence over the proposed DU development programme, Enhanced Radiation Weapons or 'Neutron Bombs', which had recently sparked intense public debate[31] are mentioned as an episode that would not bear repeating with DU. The DU ammunition tested at the 1975 Shoeburyness trilateral trials had also sparked headlines such as *"Fireballs are the new super-weapon"* in *The Guardian*[32], and a question in Parliament on the danger of DU contamination[33].

Anticipation of public concern also had a significant impact on the way in which the MoD sought approval for its proposed UK open range programme, as is shown in the extract below, and will be explored further in the next section.

> *"There is undoubtedly a possibility of public reaction to the use of this round on open ranges. We need, therefore, to present its introduction carefully, take sensible precautions, and have the backing of the health and safety and the radiological protection*

26. Draft letter to the Prime Minister (no date) Tank ammunition penetration R and D in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

27. Anonymous, (1977) Research firings of depleted uranium in the UK, D/GS (OR) 17/13/1/B, Feb 1977, in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

28. Ibid.

29. Anonymous (1977) ER2 Draft minute to secretary of state, Research firing of Depleted Uranium in the UK, D/ER2/14/16, 10 Feb 1977, in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

30. Mohr, M. (2001) Uranwaffeneinsatz: eine humanitar-volkerrechtliche Stanrtbestimmung in Humanitares Volkerrecht, p. 30

31. Aquino, M.A. (1980) The Neutron Bomb [Available at: http://www.higherintellect.info/texts/religion.occult.new_age/occult_library/Aquino_M_A-Neutron_Bomb.pdf]

32. The Guardian, 21 Oct 1975, Fireballs are the new super-weapon in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archive (TNA).

33. Allaun, F. House of Commons Hansard London: HMSO HC Deb 27 October 1975: vol. 898 cc332-3W.

34. Anonymous to Secretary of State for Defence (1977) Depleted Uranium for tank armour penetration, 28 May 1977, in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA).

"1. I think you may wish to know that one of the subjects raised by the Shah at my audience with him before Christmas was Denatured [sic] *Uranium (D.U.).*

"2. When he raised the matter I explained that there were political problems in Europe with the use of this material; apart from the emotive connotation of the word "Uranium" it did give off toxic dust when being machined and also when it hit the target. The Shah suggested that if that was a problem we could use the Esfahan Proving Ground.

"3. I did not of course comment on the suggestion but I do think that if we wanted to develop D.U. we could do it together with Iran" [39]

Internal MoD correspondance, 13th January 1977

authorities."[34]

Aware of the possible backlash, the MoD endeavoured to prepare their case carefully. It was thus decided on 11th May 1977 to:

"...have inter-departmental discussions to study the environmental safety and political aspects of carrying out the firing of depleted uranium shot in the UK for research and development purposes; and with the view that Ministerial colleagues should be consulted before a decision is taken to carry out firing in this country. S of S [Secretary of State] *also agrees with the need for careful presentation, in view of the possible public reaction."*[35]

A strategy was also developed to assure ministerial approval for the programme:

"The ministers most concerned will be the Prime Minister, the Chancellor of the Exchequer, the Foreign and Commonwealth Secretary and the Secretaries of State for Energy and the Environment. We shall need to consider the best way of seeking Ministerial approval in the light of the study by officials and the issues raised in their report...The essential points are, first, that our Secretary of State will have to defend the case for firing DU rounds on MoD R&D ranges, and secondly ***that we should seek Ministerial clearance in the least cumbersome way...***[36] *For many reasons it is advisable that the Energy and Environmental Secretaries would be informed before any public announcement is made, and if in the event a prior announcement is not made, before any firing begins, but* ***on balance this consultation should be left as late as possible***[37]*."*[38]

Managing the debate

With the need to develop DU munitions established, the 'political problems' highlighted above had to be managed

35. Brind, N.P.F. (1977) APS/Secretary of State MO 26/4/2, 11 May 1977, in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA).

36. Highlighted by the author.

37. Ibid.

38. CSA (MoD official) (1977) Depleted uranium for tank armour penetration, 6 Apr 1977, in Tank guns and self-propelled guns: includes use of depleted uranium for tank armour penetration, DEFE 13/1111, The National Archives (TNA).

39. Anonymous (1977) Loose minute, D/HDS/1/23, 13 Jan 1977, in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

in order to gain approval for the next stage of R&D: developing and testing DU munitions on open ranges in the UK. Given its toxic and radioactive properties, and the public perception of nuclear issues, convincing ministers to approve open firings of the contentious ammunition would be difficult. This section will explore the ways in which the MoD managed the debate around DU to ensure political support for its development programme.

THE INTER-DEPARTMENTAL REPORT

To help facilitate approval, the MoD undertook inter-departmental discussions to study the environmental safety and political implications of open air firing in the UK. This study was then used to seek the approval of the appropriate safety authorities. These discussions concluded:

> *"...in full consultation with the National Radiological Protection Board and with the regulatory authorities in the Departments responsible for different aspects of radiological and environmental safety. An agreed report was endorsed by the Nuclear Policy (Official) committee on the 15th June on the understanding that we would implement the control arrangements described in the report."*[40]

This study was significant in gaining ministerial approval for the R&D programme. It ensured that issues around the environmental and health impact of the DU programme could not be questioned in further political discussions, as the MoD had received approval from the Nuclear Policy Committee, the Nuclear Radiological Protection Board (NRPB) and the appropriate regulatory authorities.

However, the conclusions of this study reveal that consensus on environmental safety issues was not as clear cut as implied:

> *"The* [interdepartmental] *study also considered the acceptable surface density of uranium on grazing grass. Although the Atomic Weapons Research Establishment calculated the acceptable level to be 1g/m2 the Ministry of Agriculture Fisheries and Food pointed out that no experimental evidence existed to support these figures and at first proposed an experimental programme to obtain such evidence but were content for their experimental programme to run concurrently with the MoD development firings."*[41]

Information on acceptable levels of DU contamination on grazing grass was unavailable prior to the proposals, yet the open firing programme was endorsed by MAFF and other relevant authorities. Despite this uncertainty over the environmental impact of DU firings, the MoD was able to utilise MAFF endorsement to ensure that the proposals could not be questioned on the grounds of environmental safety.

Other key research gaps also existed, for instance; the effect of DU dust inhalation on health, the behaviour of DU in the soil, and its impact on groundwater and marine life. These knowledge gaps and many others were identified more than 20 years later by UNEP, the Royal Society and the MoD's own research programme, long after DU weapons had been used by UK forces in the Gulf War (1991).

That a more coherent understanding over the behaviour of DU in the environment and its potential effects on human health was not available before the open range firing programme began is highly problematic.

Crucially, these assessments show no consideration of the environmental and health impact that DU munitions might have when used in conflict, and the consequence of this for civilians. The acceptability of munitions that cause long term contamination and health risks is not considered. Yet the study is used by the MoD to placate the concerns of ministers, and ensure that the development programme is approved.

A-10 AMMUNITION STORAGE REQUEST AND HAZARDS DOWNPLAYED

On September 1st 1978, the US Embassy informed the MoD that the US Air Force (USAF) would be deploying

40. MoD staff (anonymous) to Prime Minister (1978) Depleted Uranium Ammunition MO 18/1, 31 Oct 1978, in New weapon technology: use of depleted uranium ammunition; proposed NATO study; legality of new conventional weapons, DEFE 11/919, The National Archives (TNA).

41. DCA(PN), MoD (no date) The effect on the environment of firing conventional tank gun armour piercing ammunition made from depleted uranium on an open range in New weapon technology: use of depleted uranium ammunition; proposed NATO study; legality of new conventional weapons, DEFE 11/919, The National Archives (TNA).

A-10 ground attack aircraft to the UK and Europe in early 1979, and that clearance was needed for the storage of the A-10's DU ammunition in the UK[42]. This provided the opportunity for the MoD to gain approval for UK based open firing trials.

Due to international relations and the precedence of NATO defence requirements within UK politics, the American request was unlikely to be turned down. A statement to the press concerning DU storage in the UK loomed and the question of the public and parliamentary acceptability of DU would have to be dealt with. Whilst politically awkward, it also presented an opportunity. In response to the MoD's notification of the American request, the Prime Minister's Office notes that:

> *"it would be desirable for these proposals* [US ammunition storage and UK open firing trials] *to be considered by Ministers at the same time as the American request for ammunition storage and, in particular, that the presentational aspects of both sets of proposals should be looked at together."*[43]

The MoD proposal for DU development and testing on open-firing ranges in the UK was duly sent to the Prime Minister and various ministries. As detailed above, concerns over environmental and radiological safety concerns were neutralised by the endorsement of the NRPB and the Nuclear Policy Committee.

The Americans were aware of the 'political sensitivity' around DU and it was suggested that the US co-ordinate with the UK on a public announcement to head off 'public misunderstanding and distortion'[44]. Along with the US correspondence requesting clearance, a draft press release and Q&A sheet on DU was sent to the MoD. This request also presented an opportunity for the MoD to tackle the second issue raised by DU: public reaction to the use of nuclear material in conventional weapons. To manage public acceptability the MoD elected to take an 'open and transparent' approach in order to set the terms of the debate. This entailed the production of carefully crafted information on DU, taking the form of a memorandum[45], press release, and a Q&A sheet. These presented DU as innocuous and militarily crucial to defend the West from the Warsaw Pact.

Efforts to manage DU and downplay its hazardous properties are visible in draft public messaging and in correspondence to the Cabinet, where DU's properties are described thus:

> *"A person could carry around a core of DU for several months without radiological danger. That gives some idea of the feeble radioactivity of a DU tank gun round."*[46]

> *"It is slightly radioactive, with about half the radioactivity of natural uranium but only one-hundredth of the activity of what we normally mean by enriched uranium; and it is slightly toxic, about the same as lead."*[47]

In these descriptions of the material properties of DU, in correspondence with ministers and public material there is no mention of the DU dust created when fired at hard targets, the potential health impacts of this and ensuing contamination issues. This is an early example of the use of simplistic or irrelevant comparisons between materials to downplay DU's radioactivity and toxicity. In later years ministers would argue that DU is 'less radioactive than the Americium in your smoke detector' which, while technically true is largely irrelevant as it has not been suggested that it be used in conventional munitions.

42. Streator, E J. (1978) Embassy of the United States of America, London, 1 Sep 1978 in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

43. Cartledge, B.G. (1978) Depleted Uranium Ammunition, 13 Oct 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

44. Streator, E J. (1978) Embassy of the United States of America, London, 1 Sep 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

45. MoD (1979) Anti-armour ammunition with depleted uranium penetrators, Memorandum, March 1979. House of Commons Library.

46. Anonymous (no date) Draft, Possible questions and answers on open range firings of DU ammunition in UK in Depleted uranium: use in conventional armament; research firings, DEFE 19/267, The National Archives (TNA).

47. MoD staff (anonymous) to Prime Minister (1978) Depleted Uranium Ammunition MO 18/1, 31 Oct 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

The following extract illustrates the efforts by MoD staff to control the description of DU's properties:

> *"It is felt that the expression 'Depleted Uranium' raises emotive issues which your Draft Minute does little to dispel... The issue should be attacked far more aggressively to make it abundantly clear that DU offers no radioactive hazard; possibly the use of such names as the US "Staballoy" or, possible, "Durametal" could remove some of the emotive aspects from the case."*[48]

Although this is but one example, archive materials[49] reveal numerous documents of drafted and re-drafted letters and memorandums that seek to present DU in the most innocuous light possible, without giving a full and clear presentation of its potential hazards or the uncertainties surrounding the impact from its use in weapons.

MINISTERIAL RESPONSE

The MoD's proposal for the open range firing programme raised a number of ministerial concerns. This section will briefly explore these concerns and the way in which they were managed to attain approval for the programme.

All responses to the proposal highlighted concern over the public reaction to news of DU weapons development. MAFF presented no objections to the proposal but stressed that the department be involved in setting acceptable contamination and intervention levels[50]. Given the fact that regulatory authorities had endorsed the MoD's interdepartmental study, no ministers were able to challenge the proposal on environmental and radiological safety grounds. Nevertheless, three departments expressed concerns: the Scottish Office, the Department of Energy and the FCO.

The Scottish Office

On receiving news of the MoD's plans, WK Fraser from the Scottish Office sent a strongly worded letter requesting that the Dundrennan range in Dumfries and Galloway not be used for the initial evaluation of the firing programme. Scottish ministers at the time were facing public opposition to a proposed nuclear power station and waste storage site in the surrounding area. It is on these grounds that Fraser makes the point that:

> *"The allegation that Scotland has been made a "nuclear dustbin" is receiving a good deal of publicity in the press..."*[51]

The increasing number of British nuclear developments based in Scotland was proving politically difficult for the Scottish Office. To obtain Scottish support, the MoD decided not to mention the Dundrennan firing range in the public memorandum. This decision was made in spite of the fact that the MoD and Scottish Office knew that for technical reasons Dundrennan would be used after initial testing at Eskmeals, Cumbria. This decision, taken to minimise public and ministerial opposition to the proposals, is a clear recognition of DU's inherent public unacceptability.

The Department of Energy

The Secretary of State for Energy's response to the proposal was to call for a cabinet discussion. When asked what his objections were, the minister noted that the public reaction was a major cause for concern and stated that:

> *"I am opposed to this in any case and would like the matter discussed for that reason."*[52]

In response to this and other concerns, a ministerial meeting was held in January 1979. MoD briefing notes for the Secretary of State for Defence on the 'line to take'[53] during the ministerial meeting reveal the MoD's attitude toward public concerns:

48. Anonymous (1977) Loose minute, Research firings of depleted uranium in the UK, D/GS (OR) 17/13/1/B, 7 Feb 1977, in Depleted uranium: use in conventional armament; research firings, DEFE 19/266, The National Archives (TNA).

49. Depleted uranium: use in conventional armament; research firings, DEFE 19/267, The National Archives (TNA).

50. Garlick, J. to Sir John Hunt (1978) Open-range firing of depleted uranium ammunition, 9 Oct 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

51. Fraser, W.K. to Sir Frank Cooper (1978) MoD, 3 Oct 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

52. Tony Benn to Prime Minister (1978) 22 Oct 1978, in New weapon technology: use of depleted uranium ammunition; proposed NATO study; legality of new conventional weapons, DEFE 11/919, The National Archives (TNA).

53. Anonymous (1979) Line to take, 19 Jan 1979, in Depleted uranium: use in conventional armament; research firings, DEFE 19/267, The National Archives (TNA).

"The full facts are set out in the public statement. It would be absurd if we were to deny ourselves the benefits of a material already in commercial use, cleared by the independent National Radiological Protection Board, and by the Regulatory Authorities and already a component of the armouries of the United States and the USSR simply through nervousness of public reaction." [54]

As noted earlier, the public statement provided a particular framing of DU that positions it as harmless. It failed to mention the specific hazards of DU dust and contamination and thus did not set out the 'full facts' as alleged above. The MoD, as mentioned earlier, had vast knowledge gaps, some of which still exist today.

Another line taken in the briefing was one that delegitimizes public concern. It is noted that:

"...public ignorance can hardly be put forward as a justification for denying us a worthwhile increment to our defence capability... while misrepresentation by ill-disposed pressure groups can never be avoided, we should not be dissuaded from taking the right decision from fear of wild and ill-informed criticism."[55]

The language used to describe public concern such as 'wild', 'ill-disposed', 'emotive' and 'ill-informed' seeks to pre-empt the nature of this concern and position it as illegitimate. A key question here is whether the strong public response is intrinsic to the radioactive nature of the weapons. If so it has serious implications for both their psychological impact on civilians and for their acceptability under international humanitarian law (IHL), as defined by the Maartens Clause[56].

The public announcements around DU's safety are further undermined by the MoD's private concerns over its properties during training:

"The Universal round cannot be fired in training because of the toxicity of the uranium dust formed when the shot breaks up on striking a hard target..."[57]

The assertion of open transparency in communications to the public remains highly questionable. However, through claiming transparency and delegitimizing public concern the MoD are able to dismiss the Secretary of State for Energy's concerns and maintain arguments in favour of a weapon they see as militarily useful.

The Foreign and Commonwealth Office

In the FCO consideration of the MoD proposals issues of international arms control efforts arose. In conversation with the then Swedish Foreign Minister Hans Blix, the matter of potential restrictions emerging from the 1979 weaponry conference[58] was raised.

It is clear from the discourse that substantial efforts would be made to fend off potential restrictions within international law, regardless of their moral basis. In doing so, the UK would prioritise military needs over humanitarian concerns:

"...if proposals are put forward to ban the use of DU, I think there would be no difficulty in joining with the US and other Western states (and, quite likely, the Soviet Union and her allies as well) to fend off such proposals..."[59]

Particular attention is paid to the incendiary effects of DU resulting from its pyrophoric nature. Responding to this, WJA Wilberforce of the FCO Defence Department notes that:

54. Ibid.

55. Ibid.

56. The Martens Clause introduced to international law in 1899, is a legal instrument which provides authority to look beyond treaty law and custom to consider principles of humanity and the dictates of the public conscience when taking account of the law of armed conflict. This position is supported by the International Law Commission, which has stated that " [the Martens Clause] ... provides that even in cases not covered by specific international agreements, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from the dictates of public conscience. Ticehurst, R. (1997) The Martens Clause and the Laws of Armed Conflict, International Review of the Red Cross, No. 317 [Available at: http://www.icrc.org/eng/resources/documents/misc/57jnhy.htm, last accessed on: 1 Sep 2012]

57. ACGS(OR), MoD (1980), D/GS(OR)2/6/2/8c, General Staff Requirement No 3851- 120mm Universal APFSDS Round, 20 Mar 1980, Tank Museum Archive, Bovington.

58. The official name of the 1979 weaponry conference is The Convention on Certain Conventional Weapons. It is also known as the Inhumane Weapons Convention. The purpose of the Convention is to ban or restrict the use of specific types of weapons that are considered to cause unnecessary or unjustifiable suffering to combatants or to affect civilians indiscriminately.

59. Wilberforce W.J.A. to Mr Moberly, (1978) PS/Mr Judd Depleted Uranium Ammunition, 16 Nov 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

"...we have always argued (without complaint from the Swedes) that any restrictions on the use of incendiary weapons should apply only to those weapons with a primary incendiary effect rather than those with a secondary incendiary effect, such as DU..."[60]

This tactic of classifying weapons by their primary and secondary effects is still used to enable states to circumvent restrictions on controversial weapons. Thus in the case of DU, incendiary effects or contamination resulting from its use are not seen as contravening IHL as they are the secondary effects of weapons whose primary purpose is to defeat armoured vehicles.

Other means to prevent a DU ban included:

"...if a proposal is made in the 1979 Weaponry Conference for a ban on the use of DU there might be scope for considering whether we should propose, as an alternative, restrictions on the uses to which such ammunition might be put... The difficulties of any such proposal in terms of verification are, of course, considerable."[61]

By restricting the use of DU to its intended purpose -piercing heavy armour- officials could argue that in specific situations legal arguments would favour weapons users. The military necessity in these specific situations would outweigh humanitarian concerns. Yet, as noted by Frank Judd of the FCO:

"I am highly dubious as to whether any undertaking only to use ammunition of this kind against tanks would be worth the paper it is written on."[62]

Judd's concerns have subsequently been borne out, with US A10 gunships firing DU ammunition being repeatedly used against civilian infrastructure in the Balkans and Iraq. Using restrictions that are understood to be impossible to police, in order to avoid a DU ban is highly disingenuous.

Clearly the MoD was ready and willing to utilise loopholes, such as the primary and secondary effect classification and restrictions on use to maintain DU munitions.

MANAGING ACCEPTABILITY

This section of the report has explored the politics surrounding early trials and the developmental stages of DU weapons in the UK. Throughout this period it is clear that DU weapons were seen as politically contentious.

It has been shown that the MoD has been aware of the radioactive and chemical hazards of DU weapons since the earliest stages of research. Despite this knowledge, the MoD sought to develop a DU weapon system it perceived as advantageous.

The MoD claimed it was taking an 'open and transparent' approach, however, hazards were downplayed and careful strategies were planned to neutralise opposition, within the cabinet and amongst the public. A truly open and transparent approach would have recognised the little that was known of the impact of DU weapons on the environment or on human health. A state that placed humanitarian considerations in high regard would have required that the impact of the weapon were fully understood before a decision was made to develop and use them.

The MoD's strategy for controlling the terms of the debate – selective openness, managing the framing of DU's hazards and undermining public opposition – developed during this period has set the ground for the UK's current policy on DU.

The methods chosen by the MoD in acquiring approval for the DU R&D programme leave open the question of whether the democratic process that led to this decision was adequate.

60. Ibid.

61. Ibid.

62. Frank Judd to Secretary of State (1978) Depleted Uranium Ammunition, 17 Nov 1978, in Storage of depleted uranium ammunition for United States A-10 aircraft in the UK, FCO 46/1832, The National Archives (TNA).

DU POLICY AFTER THE GULF WAR

Tam Dalyell MP: *"What is the assessment of the effect of depleted uranium on the water supply and on the health of the civilian population* [of Iraq]*?"*

The Prime Minister: *"We have no such assessment.."*[69]

12 May 1999

Tam Dalyell MP: *"To ask the Prime Minister...for what reasons the Government have made no assessment of the effect of depleted uranium on the water supply, and water-table and on the health of the civilian population in Iraq."*

The Prime Minister: *"The Government have not seen any peer-reviewed epidemiological research data to support the claims that there has been an increase in ill-health in southern Iraq, attributed to the use of depleted uranium based ammunition by coalition forces during the 1990–1991 conflict."*[70]

24 May 1999

Since 1991, DU weapons are known to have been used by the US in three conflicts; the Gulf War (1991), the Balkans conflicts (1994, 1995, 1999) and during the invasion of Iraq (2003); UK DU use was restricted to the two Iraq conflicts. Unsurprisingly, after each conflict public concern over the use of DU grew. This section will explore the concerns that arose after the Gulf War and the way in which they were managed by the MoD, in order to maintain political support for the continued use of DU weapons.

The Gulf War (1990-1991) in which a US led coalition engaged Iraq forces in Kuwait and Iraq, marked the first significant use of DU munitions by the US and UK in a conflict and the beginning of widespread concern over DU. The UK's first DU KE weapon, the L26 Armour Piercing, Fin Stabilised, Discarding Sabot (APFSDS) (also known as CHARM1) was deployed as an operational emergency round for use in this conflict.

Between the US and UK, 286,233kg[63] of DU was fired. On returning from the Gulf, a number of veterans subsequently reported various illnesses, which came to be known as Gulf War Syndrome, which will be referred to as Gulf War Illness (GWI).

Concern over Gulf War Illness raises questions over DU

As concerns over GWI grew, questions were raised over the use of DU weapons. Few warnings had been given to troops regarding the risk of DU exposure. In the 1991 conflict the UK's precautionary guidelines only extended to its Ordnance Disposal Units and the Ordnance Corps, who handled the transport and storage of DU munitions. The fact that many of the troops had not been warned of the risks of DU stoked the growing controversy among veterans:

> **Dr. David Clark MP:** *"Will the Minister take this opportunity to apologise to service personnel who fought in the Gulf, but who were not provided with proper advice on the health and safety risks of depleted uranium?"*

63. Fahey, D. (2003) Science or Science Fiction? Facts, Myths and Propaganda In the Debate Over Depleted Uranium Weapons, p. 13.

64. Hanley, J. House of Commons Hansard London: HMSO HC Deb 20 July 1993: vol. 229 cc 179-80.

> **Mr. Hanley MP:** *"We have been open and honest throughout... We were not forced into this. There has never been a cover-up. There has been a genuine search for information so that we can help people who might be suffering from what is suspected by certain newspapers and certain television programmes. All those who served in the Gulf who were most at risk—those who collected ordnance and those who packed the shells to bring them home because so few were used by us—were told of the risks, but, in the heat of battle, tank crews were not given the instructions, for the simple reason that time was tight. They had to use the shells to save their lives, and the risk was infinitesimal."*[64]

Given the novelty of DU weapons, their radioactivity, and the controversial means by which the story of DU had unravelled in the media, it is unsurprising that the acceptability of DU munitions came into question after 1991. As disquiet over veteran health grew, questions over the impact of DU weapons on civilian health and contamination were also raised.

Concern over DU at this time challenged the MoD's view on the balance between the perceived utility of a weapon and its potential humanitarian and environmental impact. This section will analyse how the MoD responded to these early concerns and sought to maintain DU's political acceptability despite the growing public outcry.

MoD's response to public concern

...OVER VETERAN AND CIVILIAN HEALTH

The parliamentary response to the increasing volume of questions on GWI at the time was to label the risk of DU as, variously: not significant, infinitesimal, minimal, small, low, low-level, negligible and not immediate.

The government did not fund research into the effects of DU on human health and did not investigate the potential risks of DU use to service personnel or civilians. According to the former defence minister Mr Hanley:

> *"My Department has no evidence of members of the British armed forces who served in the Gulf conflict suffering from any unexplained symptoms which would call for such an inquiry* [into the possibility of troops having been contaminated during the Gulf war as a result of the use of DU]*. The health of all service personnel will of course continue to be monitored as a matter of routine."*[65]

The 'no evidence' argument is repeatedly used as justification for a lack of investigation into the connections between DU and ill-health. Although the MoD established the Gulf Veterans' Medical Assessment Programme[66] in 1993, the programme did not specifically look into the connection between DU and GWI[67].

In regard to potentially affected civilians, the MoD states that civilians are not at significant risk. One reason given for this is that:

> *"During the Gulf conflict, British forces used small quantities of depleted uranium ammunition in sparsely populated desert areas of Iraq. This is not considered to have constituted a significant risk to the health of Iraq's civilian population."*[68]

The exchange below between Mr Tam Dalyell MP and the then Prime Minister Tony Blair reveals the UK's attitude toward assessing the risk of DU weapons to civilian populations:

> **Mr. Dalyell MP:** *"What is the assessment of the effect of depleted uranium on the water supply and on the health of the civilian population* [of Iraq]*?"*
>
> **The Prime Minister:** *"We have no such assessment, but we take the utmost care in what we do to make sure that we do not attach ourselves to the water or oil supplies. Indeed, as I said, there is evidence that, as a result of the action, one oil pipeline was damaged, but there is no evidence of damage to water supplies."*[69]

65. Hanley, J. House of Commons Hansard London: HMSO HC Deb 14 June 1993: vol. 226 cc471-2W.

66. History of UK Gulf Veterans Illness, (2012), MoD, [Available at: www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/HealthandSafety/GulfVeteransIllnesses/HistoryOfUkGulfVeteransIllnesses.htm, last accessed on: 1 Sep 2012]

67. Henderson, D. House of Commons Hansard London: HMSO HC Deb 15 March 1999: vol. 327 cc502-4W.

68. Hanley, J. House of Commons Hansard London: HMSO HC Deb 18 October 1993: vol. 230 c85W.

69. Dalyell, T. House of Commons Hansard London: HMSO HC Deb 12 May 1999: vol. 331 c309.

Mr. Dalyell: *"To ask the Prime Minister, pursuant to his oral answer of 12 May 1999, Official Report, column 309, for what reasons the Government have made no assessment of the effect of depleted uranium on the water supply, and water-table and on the health of the civilian population in Iraq."*

The Prime Minister: *"The Government have not seen any peer-reviewed epidemiological research data to support the claims that there has been an increase in ill-health in southern Iraq, attributed to the use of depleted uranium based ammunition by coalition forces during the 1990–1991 conflict."*[70]

This circular argument reveals a feeble justification for why the government takes no responsibility for civilian health assessment. These extracts show that the MoD response to claims that DU weapons may have caused ill health among veterans and civilians is one of non engagement and denial, using the well versed 'no evidence' argument to justify inaction. Government policy, without any substantial evidence, disregards claims of adverse health impacts as a result of DU use. If the MoD were to acknowledge a potential risk to civilians as a result of DU, the legality of DU weapons under IHL could be questioned[71].

...OVER RESPONSIBILITY FOR DECONTAMINATION

The UK's stated policy on dealing with post conflict remediation has always been that responsibility lies with the international community and the administration of the affected state. This implies that environmental assessment, health and environmental monitoring, decontamination or long term waste management are not the responsibility of the users of DU weapons.

In 1991, the UK Atomic Energy Authority (AEA), the UK's official advisor on nuclear safety, published a desk study that outlined the possible extent and implications of DU contamination in Kuwait. It is noted that:

"These hazards are small when compared to those during war, but can become a long term problem if not dealt with in peacetime and are a risk to both military and the civilian population."[72]

The report highlights the issues of localised contamination of soils, the problematic issue of airborne DU dust and the risk of inhalation, and notes that if DU gets into the food chain or water it could create potential problems[73].

"The problem will not go away and should be tackled before it becomes a political problem created by the environmental lobby. It is in both Kuwait and the UK's interest that this is not left to rear its head in the years to come."[74]

The official response to this paper in 1991 was:

"A small proportion of the ammunition used by British forces in the Gulf contained depleted uranium. The Ministry of Defence has a copy of a commercially produced, theoretical appraisal of the possible consequences of the use during hostilities in the Gulf of ammunition containing depleted uranium. The assessment of the situation in Kuwait is a matter for the Kuwait Government. Her Majesty's Government have not received a request for assistance with the production of such an assessment."[75]

However when a request for assistance was made by Iraq in 1991, the government's response was notable. The following question was asked by Mr Flynn MP in January 1992:

"To ask the Secretary of State for Foreign and Commonwealth Affairs what response was made by Her Majesty's ambassador to the United Nations to the plea by Iraq's Foreign Minister to the United Nations on 21 November 1991, that it establish a team of United Nations experts to determine the level and possible danger of radioactive depleted uranium shells used by allied forces in Desert Storm and Operation Granby in 1991."

70. Dalyell, T. House of Commons Hansard London: HMSO HC Deb 24 May 1999: vol. 332 cc12-3W.

71. McDonald, A (2008) Depleted uranium weapons: the next target for disarmament, United Nations Institute for Disarmament Research, (3) pp 21

72. Kuwait—Depleted Uranium Contamination, House of Lords Hansard London: HMSO HL Deb 02 March 1998: vol 586 cc145-7WA.

73. Ibid.

74. Ibid.

75. Gore, A. House of Lords Hansard London: HMSO HL Deb 16 December 1991: vol. 533 c44WA.

To which the Mr. Lennox-Boyd of the FCO replied:

"None."[76]

In 1998, another parliamentary question on the issue of contamination again revealed the government's attitude to state responsibility:

"The Ministry of Defence has made no assessment of the advantages of remediating areas in Kuwait and Iraq in which depleted uranium (DU) based ammunition was fired during the Gulf conflict; nor has any specific review of the environmental and health effects of firing this ammunition in the Gulf been undertaken by [the] *MoD. The Government do not have any information concerning the levels of DU currently present in Kuwait or southern Iraq and cannot, therefore, comment on this matter in any detail."*[77]

In spite of the strong indications that contamination could prove problematic in the AEA paper in 1991, and by SSO and RARDE officials in the early 1970s, the MoD consistently sought to avoid the issue. By stating that the responsibility lies with the 'international community' and the affected state, the UK government was able to distance itself from a fundamental aspect of DU weapons that challenges their acceptability.

Maintaining military need in the face of public concern

Increasing public concern over DU weapons put pressure on the US and UK defence establishments in the 1990s. It is not possible to access internal MoD documents from this period, however the extract below, written by Lieutenant Colonel M Y Zeihmn of the US Los Alamos National Laboratories, illuminates US sentiment on how to deal with growing public concern over DU weapons:

"There has been and continues to be a concern regarding the impact of DU on the environment. Therefore, if no one makes a case for the effectiveness of DU on the battlefield, DU rounds may become politically unacceptable and thus, be deleted from the arsenal.

If DU penetrators proved their worth during our recent combat activities, then we should assure their future existence (until something better is developed) through Service/DoD [US Department of Defence] *proponency. If proponency is not garnered, it is possible that we stand to lose a valuable combat capability.*

I believe we should keep this sensitive issue at mind when after action reports are written."[78]

This extract provides a useful insight into the military mentality towards weapons that attract public concern; active promotion of controversial weapons must be enacted to maintain the political will to continue their use.

According to Fahey (2003)[79] the US Department of Defence (DoD) overstated the capability of DU weapons to ensure the continued use of DU and avoid liability for decontamination. Fahey notes that the "real tank killer" in the 1991 Gulf War was the Maverick missile[80].

In UK parliamentary statements, the phrase DU provides 'effective capability' is commonly used. As well as overstating the need and performance of DU weapons, a troop protection narrative has been effective at distracting from their humanitarian consequences. The UK MoD is no stranger to this strategy:

"I can confirm that the United Kingdom used depleted uranium shells. We fired some 88 such shells during the conflict. The United States also fired depleted uranium shells, but perhaps I should say to my Hon. Friend and the House that we use such sophisticated and effective ordnance if it is intended to save our lives. This ordnance is extremely effective and it gets

76. Lennox-Boyd, M. House of Commons Hansard London: HMSO HC Deb 15 January 1992: vol. 201 c583W.

77. Henderson, D. House of Commons Hansard London: HMSO HC Deb 29 July 1998: vol. 317 c323W.

78. Lt col M.Y. Zeihmn to Maj. Larson, Studies&Analysis Branch (1991) The effectiveness of Depleted Uranium Penetrators, 1 Mar 1991, Los Alamos National Laboratory, New Mexico. [Available at: www.globalresearch.ca/index.php?context=va&aid=21545, last accessed on: 1 Sep 2012]

79. Dan Fahey (2003), Science or Science Fiction? Facts, Myths and Propaganda In the Debate Over Depleted Uranium Weapons.

80. The US A-10 aircraft destroyed 1,000 tanks. The US DoD report to Congress notes, "In fact, more than 90 percent of the tank kills credited to the A-10 were achieved with IR Mavericks [a non DU round] and not with its 30mm GAU-8 gun [a DU round]." US DoD, Conduct of the Persian Gulf War; Final Report to Congress, 1992: 139 in Dan Fahey (2003), Science or Science Fiction? Facts, Myths and Propaganda In the Debate Over Depleted Uranium Weapons p. 12.

through the toughest armour. Our lives were saved because of its use."[81]

This argument continues to be made in contemporary standard responses:

"Given the challenging situations in which we expect our Service personnel to operate, it would be quite wrong to deny them legitimate and effective capabilities that can help them achieve their objectives as quickly and as safely as possible."[82]

The same discourse featured in MoD statements on cluster munitions, prior to the Convention on Cluster Munitions that the UK signed in 2008:

"Cluster bombs against certain targets are the best, most effective weapons that we have. Where that is the case, the coalition is entitled to use them; otherwise we could put any ground forces we might ultimately deploy at unnecessary risk."[83]

The MoD's attitude toward public concerns over DU weapons after their use in the Gulf War (1991) was one of denial and non engagement. Despite indications to the contrary it was claimed that no evidence showed DU to pose a health or environmental risk. This was in the knowledge that very little had been done to investigate DU's civilian impact and no further research would be commissioned. No attempts were made to take responsibility for contamination, despite calls from Iraq and Kuwait and warnings from the UK's advisor on nuclear safety[84]. DU is framed as innocuous, effective and necessary to protect UK troops.

81. Hanley, J. House of Commons Hansard London: HMSO HC Deb 20 July 1993: vol. 229 cc179-80.

82. Lt. Col. Sonnex, P. to Pagano, J. (2011) Private correspondence, MoD ref: ACP-IHL-DU, 9 Nov 2011.

83. Hoon, G. House of Commons Hansard London: HMSO HC Deb 01 November 2001: vol. 373 cc1014-105.

84. Kuwait—Depleted Uranium Contamination, House of Lords Hansard London: HMSO HL Deb 02 March 1998: vol 586 cc145-7WA.

DU POLICY AFTER THE BALKAN CONFLICTS

"The Royal Society tackled claims by Geoff Hoon that DU was not a risk, the Guardian said.

Professor Brian Spratt FRS, chairman of the society's DU working group, said: "It is highly unsatisfactory to deploy a large amount of material that is weakly radioactive and chemically toxic without knowing how much soldiers and civilians have been exposed to it.""[113]

BBC, 25 April 2003

Media attention on DU grew considerably in the late 1990s during the Balkan conflicts, when researchers based in Serbia recovered NATO ammunition and established that it contained uranium[85]. This was followed by an announcement from the Americans confirming its use[86]. It was in this context that the then UN General Secretary Kofi Annan mandated UNEP to investigate DU contamination.

UNEP conducted a desk study on DU use in Kosovo in 1999[87], followed by a more detailed report in 2001. Further reports were produced examining sites in Serbia and Montenegro (2002) and Bosnia and Herzegovina (2003). In 2001, the WHO sent a mission to Kosovo[88] and produced a monograph entitled *Depleted Uranium: Sources, Exposure and Health Effects in 2001*; this was updated in 2003[89]. In 2003, UNEP published a desk study attempting to address the post-conflict risk of DU use in Iraq to the environment and human health[90]. This was followed by a UNEP run capacity-building programme in Iraq (2007)[91]. UNEP has never been able to complete a full post-conflict assessment on DU use in Iraq, due to security problems, a lack of funding and the lack of US targeting data.

International attention and increased media concern prompted institutions within the UK and the MoD to conduct their own studies. The Royal Society published a report on the health hazards of DU in May 2001 (Part 1)[92] and March 2002 (Part 2)[93]. In January 2001, in part responding to concerns from the Royal Society and *"… in recognition of concerns of many Service and former Service personnel generated by the extensive media coverage on DU"*[94] the MoD announced that it would set up a voluntary screening programme for UK personnel who had served in the Gulf War; the Depleted Uranium Oversight Board (DUOB). The DUOB produced its final report in 2007[95].

85. Cullen, D. (2011) A Question of Responsibility: depleted uranium weapons in the Balkans, p.3, International Coalition to Ban Uranium Weapons.

86. Kirby, A (1999) Pentagon confirms depleted uranium use, BBC, 7 May 1999. [Available at: http://news.bbc.co.uk/1/hi/sci/tech/337855.stm, last accessed on: 1 Sep 2012]

87. UNEP/UNCHS Balkans Task Force (BTF) (1999) The potential effects on human health and the environment arising from possible use of depleted uranium during the 1999 Kosovo conflict: A preliminary assessment.

88. WHO (2001) Report of the World Health Organisation Depleted Uranium Mission to Kosovo.

89. WHO (2001) Depleted uranium: sources, exposure and health effects.

90. UNEP (2003) Desk Study on the Environment in Iraq.

91. UNEP (2007) Technical Report on capacity-building for the assessment of depleted uranium in Iraq.

92. The Royal Society (2001) The health hazards of depleted uranium munitions Part I, Policy document 6/01, London, May 2001.

93. The Royal Society (2002) The health hazards of depleted uranium munitions Part II, London, March 2002.

94. Veterans Policy Unit (2004) The 1990/1991 Gulf Conflict Health and Personnel Related Lessons Identified.

95. DUOB (2007) Final Report of the Depleted Uranium Oversight Board.

During this period, again in response to recommendations made by the Royal Society and mass public and media concern, the MoD set up a DU Research Programme. The programme of work was:

> *"...aimed at allaying concerns and enhancing the MoD's understanding of the implications of using DU."*[96]

As this research was conducted after 2003 its implications will be explored in the next section.

This second period of concern, sparked by the discovery of DU munitions use in the Balkans, is characterised by the growth of international pressure over DU use, which continues to this day. The rest of this section will chart the ways in which the MoD sought to maintain DU's credibility within this new environment, one in which eminent bodies such as UNEP, the Royal Society and the WHO were taking an interest in DU.

UNEP, Royal Society and WHO reports

In this section we will explore the outcomes of the various reports on DU and scrutinise the handling of them by the MoD.

UNEP REPORTS

UNEP's post-conflict reports (2001, 2002, 2003) estabilished that DU dust is present in soil, air and water samples in the Balkans. The levels in all cases were found to be low and not considered cause for alarm. However due to uncertainty in respect of the long term environmental impact of DU, and in particular reference to groundwater:

> *"UNEP called for precaution, monitoring and awareness-raising for the local population."*[97]

It should be noted that, given the timescales needed to assess groundwater contamination, concerns would be unlikely to be resolved for decades.

According to Dr Mario Burger, Senior Scientific Advisor to the Post-Conflict and Disaster Management Branch of UNEP on the environmental impacts of DU ammunition, UNEP's reports on Iraq (2003, 2007) concluded that:

> *"On the basis of the measurements carried out and the committed doses calculated it was concluded that DU residues in the environment did not pose a radiological or toxicological hazard to the population at the four studied locations,* ***as long as minimum precautionary measures were implemented***[98]*."*[99]

The UNEP reports made a substantial number of recommendations which included, information being given to local residents of the potential risk of battlefield DU remnants and thorough post-conflict remedial and decontamination work. Particular concern was expressed over contamination spreading in scrap-yards in which destroyed military equipment was stored and scrap operations conducted without the separation of civilian scrap metal.

While thorough, the reports from both the Balkans and Iraq were constrained by: limited access to the full range of sites contaminated by different tanks, aircraft and armoured vehicles, the time delay between hostilities and the field assessments and the refusal of the US to share targeting information.

It is worth noting that in 2010 in its report to the UN General Assembly, UNEP stated that:

> *"...major scientific uncertainties persisted regarding the long-term environmental impacts of depleted uranium, particularly with respect to long-term groundwater contamination. Because of these scientific uncertainties, UNEP called for*

96. DU Research Programme Independent Review Board (DUIRB) (2003) First Meeting, 23 Oct 2003. [Available at: https://dl.dropbox.com/u/3981379/20120305-Tidworth%202003%20Meeting%20Record%20-%20Redacted%20-ACP%20IHL-U.doc]

97. Burger, M. (2008) The risks of depleted uranium contamination post-conflict: UNEP assessments in Disarmament Forum, vol. 3, United Nations Institute for Disarmament Research.

98. Highlighted by the author.

99. Burger, M. (2008) The risks of depleted uranium contamination post-conflict: UNEP assessments in Disarmament Forum, vol. 3, United Nations Institute for Disarmament Research.

a precautionary approach to the use of depleted uranium, and recommended that action be taken to clean up and decontaminate the polluted sites. It also called for awareness-raising among local populations and future monitoring."[100]

ROYAL SOCIETY REPORTS

The Royal Society, in response to the increasing public concern around the health effects of DU munitions use:

"...convened an independent expert Working Group to review the present state of scientific knowledge about the health and environmental effects of DU, in order to inform public debate."[101]

The reports that this working group delivered both stated that DU is:

"…a toxic and weakly radioactive heavy metal that may have adverse consequences to human health, particularly if it enters the body through inhalation, ingestion or wounding."[102]

Given the lack of significant data on civilian exposure levels, the Royal Society's approach was to estimate typical levels over a wide range of scenarios, and use animal studies and epidemiological studies of occupational exposures to uranium in non battlefield situations as a source of information on the risks of inhaling DU particles, although they recognised that: "*the parallels may not be precise"*[103].

The Royal Society noted that there were uncertainties that needed to be resolved, particularly in the area of estimated DU intakes. In respect to local residents, they stated that:

"...those who return to live in the area will be exposed to re-suspended DU particles, and in some cases contaminated food and water supplies."[104]

Although estimated intakes of DU particles re-suspended from the soil suggest a low chance of an increased cancer risk, major uncertainties existed. They called for long term monitoring to assess contamination levels in groundwater and soils.

Importantly, the Royal Society identified that firing DU produces localised hotspots rather than widespread contamination. It is also pointed out that young children are particularly at risk and remedial and decontamination measures are advised to address this.

The two reports challenged the MoD's position, highlighted just how little was known about DU and called for further research.

WHO REPORTS

After much public concern over the firing of DU in the Balkans the Special Representative of the Secretary-General and Head of the United Nations Interim Administration Mission in Kosovo (UNMIK) appealed to the WHO:

"...to send public health experts to assist in monitoring any possible health consequences of the use of depleted uranium among the civilian population."[105]

In January 2001, the WHO sent a mission to Kosovo to make an assessment of health issues in respect to DU use. Later that year the WHO also published *Depleted Uranium: Sources, Exposure and Health Effects*, a monograph containing a number of recommendations regarding DU and human health.

The WHO has also published a factsheet on its website, last updated in 2003. The factsheet gives information on DU, potential exposure pathways and resulting health impacts, and a number of recommendations[106].

100. UNEP report to UN General Assembly (2010) Effects of the use of armaments and ammunitions containing depleted uranium, Report of the Secretary-General, A/65/129/Add.1, 17 Sep 2010.

101. The Royal Society (2001) The health hazards of depleted uranium munitions Part I, Policy document 6/01, London, May 2001.

102. Ibid.

103. The Royal Society (2002) The health hazards of depleted uranium munitions Part II, London, March 2002.

104. The Royal Society (2001) The health hazards of depleted uranium munitions Part I, Policy document 6/01, London, May 2001.

105. WHO (2001) Report of the World Health Organisation Depleted Uranium Mission to Kosovo.

106. WHO (2003) Depleted Uranium - Fact Sheet N° 257 - revised January 2003 [Available at: http://www.who.int/ionizing_radiation/pub_meet/fact_press/en/, last accessed on: 1 Sep 2012]. Within all WHO literature on DU, the genotoxicity of DU has not been recognised. Keith Baverstock, formerly of the WHO has claimed that this research had been suppressed. 'Depleted uranium risk 'ignored'', 1 Nov 2006, BBC. [Available at: http://news.bbc.co.uk/1/hi/world/middle_east/6105726.stm, last accessed on: 1 Sep 2012]

WHO literature has highlighted major issues in regard to the lack of information, including reliable population data, cancer registries, and common data gathering methods[107]. The WHO worked with UNEP, sharing environmental data and thus used the findings of DU contamination hotspots in their estimation of exposure risk. They highlighted uncertainty over the long term environmental impact of DU, with particular reference to groundwater and the need to manage and monitor sites where contamination was present.

The monograph conclusions recommended clean-up operations where contamination levels are deemed inappropriate. Contamination stemming from scrap metal operations was highlighted as an issue of concern, as was the potential for young children to ingest DU from contaminated soils. Monitoring and preventative measures were suggested[108]. As with UNEP and the Royal Society's recommendations, further research was recommended.

The MoD interpretation

The MoD responded to these reports in two ways. The first was to take up some of the recommendations made after DU weapons were used in the 2003 Iraq conflict. This involved setting up the DUOB, a DU research programme and conducting preliminary environmental assessments around a limited number of DU strike sites in Kosovo and Iraq[109].

Through DfID, the UK also part-funded UNEP to run a capacity building programme to train Iraqi nationals to assess the extent of contamination. The programme and its limitations will be discussed in more detail in the next section, in which the shift in the UK's relationship to DU and its responsibilities stemming from 2003 Iraq invasion will be explored.

Although the MoD acknowledged UNEP's, the Royal Society's and the WHO's recommendations and made efforts to fulfil some of them, crucial aspects of the recommendations were not acted upon: decontamination work in Iraq, long term environmental monitoring and raising public awareness of the potential risks of DU.

These were precautionary steps deemed reasonable and necessary by Dr Mario Burger[110]. It could be argued that it is disingenuous to refer to UNEP reports as supporting the view that DU is an insignificant risk when its recommendations for risk management have not been fully implemented.

The second means by which the MoD responded to these reports was to use them to maintain DU's credibility. This was done through referring to the report outcomes as confirmation that DU is an acceptable weapon, whilst failing to adequately acknowledge the uncertainties they raised.

In a parliamentary statement following publication of the second part of the Royal Society report in March 2002 Lord Bach, defence minister noted:

> *"We accept the assessment of the health consequences of depleted uranium (DU) which was made by the Royal Society Depleted Uranium Working Group (The Health Hazards of Depleted Uranium Munitions) (2001, 2002)). This concluded that the health consequences would be minimal except for a small number of extreme cases... Only within 50 metres of a DU penetrator strike would DU levels possibly be significant enough to necessitate precautions to prevent or reduce possible intakes. Elsewhere, health risks are deemed to be negligible. The independent research by the Royal Society DU Working Group and other eminent scientists, for example within the United Nations Environment Programme, supports this view. With regard to civilians, the aforementioned Royal Society reports state that, "For those returning to live in areas where DU munitions were deployed, including peacekeepers, the inhalation intakes from re-suspended DU are considered to be unlikely to cause any substantial increase in lung cancer or any other cancers."*[111]

107. WHO (2001) Report of the World Health Organisation Depleted Uranium Mission to Kosovo.

108. WHO (2003) Depleted uranium: sources, exposure and health effects.

109. MoD (2012) Depleted Uranium and the Environment. [Online] [Available at: www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/HealthandSafety/DepletedUranium/DepletedUraniumAndTheEnvironment.htm, last accessed on: 1 Sep 2012]

110. Burger, M. (2008) The risks of depleted uranium contamination post-conflict: UNEP assessments in Disarmament Forum, vol. 3, United Nations Institute for Disarmament Research. p. 53.

111. Bach, W. House of Lords Hansard London: HMSO HL Deb 26 March 2003 vol 646 cc81-2WA 81WA

ARMED FORCES AND CIVILIAN PRECAUTIONARY MEASURES

In response to public concern in 2001 the MoD made a statement on precautionary measures it would adopt for UK Armed Forces personnel:

> "Conscious of the potential risks which DU posed, we issued precautionary guidance to our forces in Kosovo about the need not to approach recently struck burned out armoured vehicles possibly hit by DU, which present the main hazard, and to wear suitable protective clothing if they had to work in the vicinity of these vehicles."[115]

On the eve of the 2003 Iraq invasion, the MoD implemented basic precautionary measures for military personnel on operations where DU would be used. This included creating a DU information card which informed soldiers that they were being deployed to an area where DU munitions had been used. It explained that:

> "DU is a weakly radioactive heavy metal, which has the potential to cause ill health."[116]

The card informed soldiers that a urine test to detect DU was available on return from conflict. The MoD also issued radiation dose meters to tank crews that loaded DU munitions[117].

In reference to civilian populations, the MoD stated that:

> "There is no reliable scientific or medical evidence to link DU with the ill health of people living in regions where DU has been used."[118]

There has been no urine testing done on civilian populations, and no specific information given warning civilians of hazard reduction methods.

This statement reveals a selective view of the outcomes of the reports. The scientific uncertainties are not acknowledged and the issue of 'hotspots' of DU contamination is communicated in a way that implies it is unproblematic, rather than an issue of concern. That more data from the long term monitoring of groundwater and health was needed to provide a better understanding of the effects of DU on local populations is not acknowledged.

Comparing these MoD statements to the Royal Society press release that accompanied the publication of the 2001 report highlights the differing ways in which this report was presented:

> *"Professor Brian Spratt, chairman of the Royal Society working group that prepared the report, said: "There is limited information about the amounts of depleted uranium that soldiers have been exposed to on the battlefield. Without additional measurements, it is not possible to rule out a significantly increased risk of lung cancer among a small group of soldiers who may have been exposed to very high levels of depleted uranium in extreme situations."*[112]

During the Iraq invasion in 2003:

> *"The Royal Society tackled claims by Geoff Hoon that DU was not a risk, the Guardian said.*
>
> *Professor Brian Spratt FRS, chairman of the society's DU working group, said: "It is highly unsatisfactory to deploy a large amount of material that is weakly radioactive and chemically toxic without knowing how much soldiers and civilians have been exposed to it.""* [113]

Professor Brian Spratt called for urine samples to be taken from soldiers and said that long-term monitoring of milk and water supplies in Iraq were necessary to monitor the potential health risk to civilians.

The Royal Society clearly saw the issue of the health hazards from DU as non-conclusive and stated that more

112. The Royal Society (2001) Depleted uranium may cause higher risk of lung cancer for some soldiers, 22 May 2001 [Available at: http://royalsociety.org/News.aspx?id=1232&terms=depleted+uranium&fragment=&SearchType=&terms=depleted%20uranium, last accessed on: 1 Sep 2012]

113. BBC (2003) Depleted uranium tests for troops, 25 Apr 2003. [Available at: http://news.bbc.co.uk/1/hi/uk/2974619.stm, last accessed on: 1 Sep 2012]

114. Taylor, A. House of Lords Hansard London: HMSO HL Deb 19 Feb 2008: column WA42.

information was needed. Yet despite this, the MoD used the Royal Society, UNEP and WHO reports to justify the misleading statement of:

> *"...the international scientific consensus* [confirms] *that neither the level of DU in the environment nor the risk to the health of civilians in Iraq is significant."*[114]

This manipulation of the report outcomes adds weight to the argument that the MoD continually sought to manage the acceptability of DU and maintain its credibility. Its underlying policy that DU weapons will be used and its acceptability managed had not changed since the 1976 trilateral trials, in spite of a growing body of scientific evidence that highlighted uncertainty and recommended precaution.

115. Statement by the UK Minister for the Armed Forces on Depleted Uranium, AD HOC Committee on Depleted Uranium, 10 Jan 2001 [Available at: www.nato.int/du/docu/d010110a.htm, last accessed on: 1 Sep 2012]

116. Veterans Policy Unit (2004) The 1990/1991 Gulf Conflict Health and Personnel Related Lessons Identified

117. MoD (2012) Depleted Uranium and Health [Available at: www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/HealthandSafety/DepletedUranium/DepletedUraniumAndHealth.htm, last accessed on: 1 Sep 2012]

118. Ibid.

DU POLICY DURING THE INVASION OF IRAQ

"Legally, we have no obligation to clean up the remains of the DU we used. It's the responsibility of the new regime in Baghdad.

"But morally we do recognise an obligation, as we have in the past. We helped in the removal of DU from Kosovo.

"We'll be helping in any way we can, specifically by providing money for the clean-up, and by making available records of where the ammunition was fired.

"There may not always be any records, for instance where there was a skirmish - but insofar as we have them, we'll make them available."[119]

MoD Spokeswoman, BBC, 23 April 2003

On March 19th 2003, US led Coalition Forces (comprised of US and UK armed forces), invaded Iraq. During this stage of conflict approximately 141,920kg of DU was fired by the US and UK[120].

This was the start of the Iraq War that lasted more than eight years, with the last US combat troops leaving Iraq in December 2011. The period of conflict most relevant to this report is the first six week 'invasion' stage, where DU is known to have been used. It is also during this period that public concern around the war and the use of DU was at its height.

During the conflict, the UK fielded 116 Challenger tanks equipped with CHARM3 DU ammunition. MoD statements note that 1.92 tonnes of DU were expended in this operation[121], which equates to approximately 420 individual rounds[122]. Some information on the location of DU firing points was subsequently released, initially to UNEP and later under a Freedom of Information (FoI) request[123]. Challenger 2 tanks used DU in urban areas of Basra and Az Zubayr[124].

Amidst the public opposition to the war and renewed focus on DU, the Royal Society and UNEP put pressure on the MoD to take a more responsible approach to DU weapons.

In a UNEP press release dated 24th April 2003, guidelines on how to minimise the risk of accidental DU exposure were given, alongside the statement that:

> *"The intensive use of DU weapons has likely caused environmental contamination of as yet unknown levels and a study would require receiving precise coordinates of the targeted sites from the military."*[125]

The mass unpopularity of this war combined with the focus on DU by UNEP and the Royal Society necessitated a shift in the UK government's policy on DU.

119. Kirby, A. (2003) UK to aid Iraq DU removal, BBC, 23 Apr 2003 [Available at: http://news.bbc.co.uk/1/hi/sci/tech/2970503.stm, last accessed on: 1 Sep 2012]

120. The figure of 141,920kg of DU fired is calculated by adding the estimated US figure of 140,000kg to the stated UK figure of 1,920kg as noted respectively in: Wise Uranium Project (2011) Third partial disclosure of amount of DU used in Iraq [Available at: www.wise-uranium.org/dissgw.html#GULF03, last accessed on: 1 Sep 2012]; and Hoon, G. House of Commons Hansard London: HMSO HC Deb 04 June 2003: vol. 406 cc445-6W.

121. Hoon, G. House of Commons Hansard London: HMSO HC Deb 04 June 2003: vol. 406 cc445-6W

122. Uranium Weapons Network (2010) UK Uranium Weapons Network submission to the Chilcot Inquiry on the UK's use of depleted uranium munitions in Iraq, p.4. [Available at: www.cadu.org.uk/cadu/articles/art_463.html, last accessed on: 1 Sep 2012]

123. Lt. Col. Sonnex, P. to Weir, D. (2011) DU Strikes Coordinates around Basrah Iraq, Source: FoI request. [Available at: www.whatdotheyknow.com/request/depleted_uranium_hazard_awarenes#incoming-217858, last accessed on: 1 Sep 2012]

124. MoD (2003) Operations in Iraq: Lessons for the Future, MoD Directorate General Corporate Communication, Dec 2003, p. 22

125. UN News Centre (2003) Top UN environmental body calls for urgent action in Iraq, 24 Apr 2003 [Available at: www.un.org/apps/news/story.asp?NewsID=6834&Cr=&Cr1=, last accessed on: 1 Sep 2012]

MoD position on responsibility shifts

Prior to the political pressure generated by the 2003 war, the MoD's position on responsibility for post-conflict decontamination had been:

> *"The post-conflict administrators of Iraq will be responsible for monitoring DU levels in the environment, and cordoning off and decontaminating sites of penetrator impacts. The United Kingdom has a long tradition of providing practical and financial help in such situations."*[126]

Three weeks after this statement, in response to the mass unpopularity of the war and pressure from the Royal Society and UNEP, a MoD spokeswoman told the BBC that:

> *"Legally, we have no obligation to clean up the remains of the DU we used. It's the responsibility of the new regime in Baghdad.*
>
> *"But morally we do recognise an obligation, as we have in the past. We helped in the removal of DU from Kosovo.*[127]
>
> *"We'll be helping in any way we can, specifically by providing money for the clean-up, and by making available records of where the ammunition was fired.*
>
> *"There may not always be any records, for instance where there was a skirmish - but insofar as we have them, we'll make them available."*[128]

This statement marked the first time that a public acknowledgment of a moral obligation for post-conflict clean up of DU had been made. As a result of recognising this 'moral obligation' the following risk reduction measures were taken:

> *"British forces are taking the following actions to minimise the risk posed to civilians by Depleted Uranium (DU). DU fragments on the surface are being removed from the battlefield as they are discovered. Local people have been warned through signs and leaflets that they should not go near, or touch, any debris they find on the battlefield. Military vehicles known to have been hit by DU munitions within the southern sector of Iraq under British military control have been clearly marked."*[129]

Following calls from the Royal Society[130] the MoD provided UNEP with details of UK DU firing points[131]. Through DfID, the UK also contributed £717,000 to UNEP's US$5m capacity-building programme, which sought to train Iraqi nationals to assess contaminated hotspots[132].

The extent of the MoD's 'moral obligation'

The recognition by the UK of its moral obligation on DU was significant, but was it matched by actions on the ground? Please note that remediation and hazard awareness work undertaken by the Iraqi government has not been detailed in this section and is beyond the scope of this report.

REMEDIATION WORK

The UK stated that surface-lying DU fragments would be removed as part of standard ordnance clearance work. No plans were made to remove buried DU penetrators, except small amounts for scientific purposes[133]. This meant that UNEP's concerns over groundwater contamination would not be resolved.

126. Ingram, A. House of Commons Hansard London: HMSO HC Deb 02 April 2003: vol. 402 cc737-8W 737W.

127. The reference to 'the removal of DU from Kosovo' relates to a MoD environmental monitoring programme in the British led sector on Kosovo in January and August 2001. This programme was initiated in response to media and public concern following the revelation that DU had been used in the Balkan conflicts. The programme was focused on conducting an environmental survey, not decontamination. Some DU penetrators and fragments were removed for scientific purposes. By referring to this work as an example of having recognised an obligation for clean-up is misleading. Dstl Environmental Services Department (2003) MoD DU Environmental Monitoring in the Balkans & Iraq [Available at: https://dl.dropbox.com/u/3981379/20120306-Tidworth%202003%20Environmental%20Monitoring-ACP%20IHL-U.ppt]

128. Kirby, A. (2003) UK to aid Iraq DU removal, BBC, 23 Apr 2003 [Available at: http://news.bbc.co.uk/1/hi/sci/tech/2970503.stm, last accessed on: 1 Sep 2012]

129. Ingram, A. House of Commons Hansard London: HMSO HC Deb 21 January 2004 vol 416 cc1246-8W.

130. Kirby, A. (2003) Coalition 'must reveal DU targets', BBC, 24 Apr 2003 [Available at: http://news.bbc.co.uk/1/hi/sci/tech/2972613.stm, last accessed on: 1 Sep 2012]

131. Lt. Col. Sonnex, P. to Weir, D. (2011) FoI request Ref: 07-09-2011 101833-001, 29 Jun 2011. [Available at: www.whatdotheyknow.com/request/depleted_uranium_hazard_awarenes#incoming-217858]

132. Howells, K. House of Commons Hansard London: HMSO HC 14 Jun 2005 : Column 331W.

Although the UK did release firing coordinates to UNEP, its Coalition partner (the US) did not release any details. In respect to this, when questioned in parliament, defence minister Ivor Caplin stated that:

> *"Decisions on the release of information on the use of depleted uranium (DU) munitions by United States Forces during the recent conflict in Iraq are a matter for the US Department of Defence. There are currently no plans to produce a combined report of DU firings by United Kingdom and US Forces."*[134]

There is little precise data on the amount of DU fired by the US during the invasion of Iraq, although in March 6, 2004, US government official Michael Kilpatrick quoted a figure of between 120,000 and 140,000 kg of DU[135]. When compared to the UK's 1,900 kg it is easy to see why the release of US coordinates remains crucial to undertaking any meaningful measures towards decontamination or hazard awareness work in Iraq.

On the 4th February 2004, defence minister Adam Ingram stated that;

> *"To date eight military vehicles have been identified as having been hit by depleted uranium (DU) munitions within the southern sector of Iraq under British military control. All these vehicles have been clearly marked. Arrangements are currently being negotiated with the US for a contractor to collect and securely store these military vehicles."*[136]

Given that approximately 420 rounds of DU were fired by the UK in the conflict, it is clear that the number of vehicles and sites contaminated by DU would far exceed the eight vehicles identified; particularly if the munitions are as effective as the MoD claim.

Interestingly a FoI request on the subject of the disposal of these eight contaminated vehicles has revealed that the MoD holds no information regarding their fate[137].

The only other contaminated vehicles that have been identified as having been removed from Iraq following 2003 are two British tanks. These were damaged in 'blue on blue'[138] incidents, and removed to Eskmeals, Cumbria, UK for research purposes[139].

Considering the extent of contamination that more than 420 rounds of DU could produce, the suggested though unsubstantiated clearance of eight military vehicles seems a token gesture; as such, the UK's claims that it recognised a 'moral obligation' and was 'helping in any way we can' seems at best disingenuous, and at worst irresponsible.

HAZARD AWARENESS

The quantity and quality of public information given to Iraqis on the hazards from DU remnants also remains unclear, defence minister Adam Ingram stated that the MoD are:

> *"...carrying out activities to reassure civilians that the risk posed to them by DU is as minimal as practically possible. Surface-lying DU fragments are being removed from the battlefield as they are discovered, and Iraqi locals have been warned through leaflets and signs that they should not go near or touch any debris they find on the battlefield."*[140]

Iraqis were not given any specific information concerning the potential hazard of DU and measures that could be taken to minimise this[141].

One specific hazard resulting from DU use, as highlighted by UNEP, are vehicles destroyed by DU ammunition

133. Caplin, I. House of Commons Hansard London: HMSO HC Deb 18 July 2003 vol 409 cc900-1W.

134. Caplin, I. House of Commons Hansard London: HMSO HC Deb 19 September 2003 vol 10 c1159W.

135. Wise Uranium Project (2011) Third partial disclosure of amount of DU used in Iraq [Available at: www.wise-uranium.org/dissgw.html#GULF03, last accessed on: 1 Sep 2012]

136. Ingram, A. House of Commons Hansard London: HMSO HC Deb 02 February 2004 vol 417 cc746-7W.

137. J9 POLOPS 10A to Kellay, A. (2012) Source: FoI request, Ref: 24-04-2012-135958-014, 3 May 2012. [Available at: www.whatdotheyknow.com/request/du_contaminated_vehicle_disposal#incoming-284522, last accessed on: 1 Sep 2012]

138. 'Blue on blue' otherwise known as a friendly fire incident, refers to inadvertent firing towards one's own or otherwise friendly forces while attempting to engage enemy forces.

139. J9 POLOPS 10A to Kellay, A. (2012) Source: FoI request, Ref: 24-04-2012-135958-014, 3 May 2012. [Available at: www.whatdotheyknow.com/request/du_contaminated_vehicle_disposal#incoming-284522, last accessed on: 1 Sep 2012]

140. Ingram, A. House of Commons Hansard London: HMSO HC Deb 09 March 2004 vol 418 cc1403-5W.

141. Lt. Col. Sonnex, P. to Weir, D. (2011) FoI request Ref: 07-09-2011 101833-001, 29 Jun 2011. [Available at: www.whatdotheyknow.com/request/depleted_uranium_hazard_awarenes#incoming-217858, last accessed on: 1 Sep 2012]

which find their way into the scrap metal trade, putting numerous people at risk of contamination. It is estimated that 8,000 Iraqi tanks, armoured personnel carriers and artillery pieces have been scrapped since 2003[142].

A UNEP investigation of an Iraqi scrapyard revealed that there was no separation of military and civilian scrap material, that crushing and cutting of scrap occurred with minimal precautions and that the site bordered a residential area[143]. Without specific efforts to separate and dispose of contaminated military equipment, the uncontrolled spread of contamination could occur, placing civilians at risk.

The example of scrapyards shows that dealing with DU contaminated remnants of war requires specifically tailored plans for decontamination and remedial work. Giving non-specific information to civilians, which amounts to stay clear of 'battlefield debris' is an inappropriate means of dealing with the specific hazards from DU munitions. This is particularly poignant as a substantial amount of the fighting during the Iraq invasion took place in urban areas.

FUNDING RESEARCH AND CAPACITY-BUILDING

In terms of research and capacity-building, the UK funded a programme of research and workshops on DU[144], and a UNEP capacity-building programme via DfID. Both of these projects were limited and cannot be used to defend a claim of responsible behaviour.

The MoD research programme did not investigate civilian exposure, and on the ground environmental monitoring only ever reached a preliminary stage because of the unstable situation in Iraq since the invasion[145]. Although the project was originally envisaged as a 'detailed scientific research programme on destroyed tanks'[146], it was reduced to investigating only two strike locations because of security concerns and the prior removal of destroyed vehicles by British troops[147].

UNEP's capacity building programme was also severely hampered by the refusal of the US to release its firing coordinates, thus the programme was only able compile a list of four locations for investigation[148]. DfiD's funding appears to have been insufficient for even such a limited investigatory programme:

> *"...teams on the ground were not supplied with radiation meters able to detect alpha radiation, and a lack of basic equipment such as disposable gloves increased the chance of cross contamination of samples."*[149]

In spite of these limitations and the three year gap between the invasion and the site visits, DU contamination was confirmed at Az Zubayr where UK Challenger 2 tanks had been active.

UNEP's 2007 report recommended that the international community fund future projects, as requested by Iraq's Ministry of the Environment. This appears to have been ignored by the UK and US. This may in part be due to an unwillingness by states to be held responsible for contamination. As the case study of US remedial work in Kuwait (p.39) shows; user and affected states fully understand public objection to DU contamination, remedial work is costly and technically difficult, and user states are aware of 'broader policy ramifications' of DU remedial work and keen not to set precedents for decontamination.

The limited funding of investigatory work by the UK government is in stark contrast to the active role taken by both the UK and US in explosive ordnance disposal, where teams in both sectors of occupied Iraq quickly began to safely dispose of both Iraqi and Coalition ordnance[150].

142. UNEP (2007) UNEP in Iraq: Post-Conflict Assessment, Clean-up and Reconstruction, Dec 2007.

143. Ibid.

144. Smith, B. (2007) The MoD Depleted Uranium Programme Independent Review Board: Closure Report, CR/07/065N, Natural Environment Research Council (NERC) [Available at: http://core.kmi.open.ac.uk/display/60463, last accessed on: 1 Sep 2012]

145. MoD (2012) Depleted Uranium and the Environment. [Available at: www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/HealthandSafety/DepletedUranium/DepletedUraniumAndTheEnvironment.htm, last accessed on: 1 Sep 2012]; Smith, D. and Brown, R. (2006) Radiological Assessment of Depleted Uranium Impact Locations in Iraq, Defence Science & Technology Laboratory (Dstl) Environmental Sciences Department.

146. MoD Director General Corporate Communication (2003) Operations in Iraq: First Reflections, July, 2003.

147. Smith, D. and Brown, R. (2006) Radiological Assessment of Depleted Uranium Impact Locations in Iraq, Dstl, Environmental Sciences Department.

148. UNEP (2007) Technical Report on capacity-building for the assessment of depleted uranium in Iraq.

149. Uranium Weapons Network (2010) UK Uranium Weapons Network submission to the Chilcot Inquiry on the UK's use of depleted uranium munitions in Iraq, p.7. [Available at: www.cadu.org.uk/cadu/articles/art_463.html, last accessed on: 1 Sep 2012]

US REMEDIAL WORK IN KUWAIT

Wikileaks cables have made public correspondence between the US Embassy in Kuwait and Washington DC. Correspondence, dated 2 March[151] and 10 December 2009[152], notes Kuwaiti grievance over the failure of the US military to adequately decontaminate the Kuwaiti Udairi Range Complex in which DU was fired in training during 2003.

According to correspondence, a radiological survey conducted in 2009 found radiation levels on the firing range to be significantly higher than the maximum level considered acceptable under prevailing safety standards. Cleanup operations had been undertaken by US decontamination teams during the period September-November 2003, after the site had been used to test fire DU. The cause of the 2009 high radiation levels remain unknown though US officials make assurances to Kuwaiti officials that no DU has been fired since 2003.

The Kuwaiti government makes it clear that if this issue was not resolved quickly there would be consequences for their political relationship with the US. It is noted that a major concern for the Kuwaiti government is the adverse public reaction in the event of a press leak.

It is also interesting to note that the US attitude toward the 'DU residue issue':

> "[The] Embassy fully understands the complexity of the DU residue issue and the broader policy ramifications of establishing a mitigation precedent in this case..."[153]

They reconcile the issue of setting a precedent by noting that this work could be justified as following through on an existing commitment.

Remedial work at the Udairi range is at the time of writing being undertaken by AECOM Government Services with the Military Munitions Response Program services budget set at $5.26million[154].

This case shows that the Kuwaiti public is clearly expected to find contamination unacceptable. Decontamination work is costly and has previously been handled incompetently by US contractors. Due to crucial political ties in the Middle East the US were forced to respond to Kuwaiti concerns though note the 'broader policy ramifications' of setting a mitigation precedent.

Actions speak louder than words

An examination of the practical outcome of the MoD's public statement of a 'moral obligation' to take responsibility for clean-up reveals that far less was done than implied.

Parliamentary statements by defence ministers in regard to post-conflict decontamination imply that work is being done to reduce the risk of DU contamination, when in fact little was done on the specific decontamination measures that are required when dealing with DU. Stating that eight contaminated vehicles have been removed obscures the fact that the vast majority of DU contaminated vehicles and other targets remain unaccounted for.

The mass unpopularity of the invasion of Iraq, negative media coverage and the work of UNEP and the Royal Society forced the MoD into announcing their 'moral obligation'; a statement, it would appear, made to maintain an air of respectability. In practice this has been shown to have been a façade, enabling the MoD to maintain political support for the controversial weapons.

150. MoD Directorate General Corporate Communication (2003) Operations in Iraq: Lessons for the Future, December 2003, p. 68.

151. US Embassy Kuwait to RUEHC/SECSTATE Washington DC (2009) Depleted Uranium Detection At Range Prompts Convoking Of Ambassador, Wikileaks ref:09KUWAIT180, 2 Mar 2009 [Available at: www.cablegatesearch.net/cable.php?id=09KUWAIT180&q=depleted%20kuwaiti%20uranium, last accessed on: 1 Sep 2012]

152. US Embassy Kuwait to RUEHC/SEC STATE Washington DC (2009) Embassy endorses arcent DU containerization plan, Wikileaks ref: 09KUWAIT1153, 10 Dec 2009 [Available at: www.cablegatesearch.net/cable.php?id=09KUWAIT1153&q=depleted%20kuwait%20uranium, last accessed on: 1 Sep 2012]

153. Ibid.

154. Farrell, T.J (2012) T.J. Farrell Overview, LinkedIn [Available at: www.linkedin.com/pub/t-j-farrell/20/62a/859, last accessed: 1 Sep 2012]

DU POLICY POST 2003

"...lessons learnt in respect of the assessment of the health and broader environmental impacts of DU based munitions [should] *be applied at an early stage in the development of alternative military technologies."*[155]

Smith, B. Chairman, The MoD Depleted Uranium Programme Independent Review Board, 2007

By 2003, a growing body of evidence from UNEP, the WHO, the Royal Society and academics had added considerably to the understanding of DU's health and environmental risks – a key determinant of its acceptability, however uncertainties remained.

Before reviewing the UK's current policy on DU weapons, this section will examine two themes that have influenced the developing politics of DU since 2003: the MoD's own research programme and the resurgence of international pressure for a ban on the weapons.

The MoD'S DU research programme

In March 2002, faced with considerable public and political pressure, the MoD announced proposals for a DU research programme, in:

> *"...recognition of its commitment to address veterans' and public concerns relating to the health and environmental implications of the military use of DU."*[156]

The programme was reviewed by an independent review board (DUIRB) to demonstrate the MoD's commitment to transparency. It commissioned a number of independent bodies to undertake research on specific knowledge gaps. Please see the Appendix for a list of the research items.

The Natural Environment Research Council (NERC) was given responsibility for commissioning parts of the research. Other organisations involved in the programme included the independent DUOB, the Defence Science and Technology Laboratory (Dstl) and QinetiQ.

The research programme is proof that the MoD was sensitive to the concerns of the public and veterans during this period. However, it could be argued that much of this research should have been done prior to the weapons entering service and certainly before they were used.

Furthermore, the programme's scope was heavily skewed in favour of DU's environmental behaviour, with only one

155. Smith, B. (2007) The MoD Depleted Uranium Programme Independent Review Board: Closure Report, CR/07/065N, Natural Environment Research Council (NERC) [Available at: http://core.kmi.open.ac.uk/display/60463, last accessed: 1 Sep 2012]

156. Ibid.

of twelve research items focusing on health effects - a literature review of effects of DU exposure on human health (see Appendix). Crucial civilian exposure studies have yet to be conducted (see Exposure studies and civilian health, p. 41), and as noted by Professor Randall Parrish, NERC Depleted Uranium Science Coordinator:

> *"Finally, while not in the remit of the DU research programme, the lack of studies of the health consequences of DU to humans and living organisms remains a major gap in research, in spite of its potential importance. Strategic research in this area should be a priority in order to better understand the threshold at which DU contamination has consequences to health of the humans and environment."*[157]

KNOWLEDGE GAPS

As late as 2006, and after considerable resources had been applied to the programme, crucial knowledge gaps remained. These included, but were not restricted to, the definitive levels of exposure associated with battlefield use of DU, the fate of DU fired into the sea at Kirkcudbright and the consequences for marine life, and the definitive radiochemical composition[158] of the DU used in UK munitions[159].

In its closure report, the DUIRB noted that further research is needed in these areas, with particular reference to the radiochemical analysis of UK DU munitions. They also recommended that opportunities for further sampling for exposure to DU should be sought. Importantly, the board noted that:

> *"...lessons learnt in respect of the assessment of the health and broader environmental impacts of DU based munitions* [should] *be applied at an early stage in the development of alternative military technologies."*[160]

EXPOSURE STUDIES AND CIVILIAN HEALTH

Troop exposure was not a research item on the MoD's DU research programme, however due to pressure from the Royal Society the MoD did fund two programmes that collected data on troop exposure to DU. These studies were conducted by DUOB and the King's Centre for Military Health Research (KCMHR), which took urine samples from veterans from the Gulf War (1991) and Operation TELIC (Iraq, 2003) respectively. These studies used careful urine sampling techniques to detect DU exposure amongst veterans; the results showed no detectable DU within the samples[161].

Prof. Randall Parrish, an expert in uranium isotope analysis, has shown that aerosolised DU can remain in the body for more than 20 years[162]. This result demonstrated that the DUOB's results most likely establish that the veterans tested were not exposed to DU, rather than they were exposed to DU and this initial exposure has decayed.

The MoD has taken these results to mean 'DU use does not result in significant exposure' thus there is no risk to health. However exposure scenarios for civilians and military personnel differ[163].

Civilians living and working in areas that have been heavily contaminated by DU weapons may face chronic low level exposure, yet this has not been investigated. The 2002 Royal Society report recommended long term environmental monitoring of water and milk in Iraq[164] but this was not on the MoD's research agenda and is yet to materialise. The MoD remains unable to address a key public concern of the risk that DU weapons pose to civilians.

157. Parrish, R (2010) Impacts of Depleted Uranium to the natural environment: A report commissioned by the Natural Environmental Research Council for the UK Ministry of Defence.

158. DU used in penetrator rods has been found to contain radiochemical contaminants. These contaminants are the result of mixing reprocessed uranium with depleted uranium in the US. Dstl research has showed that these contaminants include substances such as the highly reactive plutonium, thus DU may be more radioactive and chemically toxic than previously considered. This research has also shown that the composition of radiochemical containments changes within each batch of DU that is processed into penetrators, thus very little is known about the definitive radiochemical make-up of DU, how much more radioactive it actually is and what consequences might be for those that come into contact. Previous studies considering the health hazards of DU have only modelled their assessments on 'clean' DU rather than taking into account the impact of additional radiochemical contaminants. Dstl, (2006) Radiochemistry: Overview of the radiochemical analysis task, Presentation at 2006 MoD Depleted Uranium Workshop, [Information gathered from FoI request, available at: https://dl.dropbox.com/u/3981379/20120306-Tidworth%202006%20Radiochem%20Analysis-ACP%20IHL-U.ppt]

The lesson is clear - the MoD should ensure that they understand and assess the health and environmental impacts of weapons at an early stage of research and development. This is reminiscent of the warnings given by RARDE and SSO in the early 1970s. Significantly, the research programme also marked the beginning of research into less toxic alternatives to DU weapons.

This shift was a tacit acceptance that radiologically hazardous and chemically toxic conventional weapons are unacceptable. Yet DU weapons have remained in the UK's arsenal as the MoD believes that their loss without an adequate replacement would create a capability gap.

International political attention

Since 2007, international pressure on DU has again gained momentum. While previously driven primarily by media coverage of DU's use in conflict, sustained pressure is now being applied through civil society initiatives in cooperation with states and parliamentarians.

DU weapons have been the focus of three UN General Assembly resolutions[165], 2010's resolution called for greater transparency following the use of DU to facilitate research and decontamination. The UK voted against the resolution, which was supported by 148 states, despite an Early Day Motion signed by 93 MPs urging the UK to vote in favour[166].

The use of DU weapons has also been condemned by four resolutions in the European Parliament, including a landslide resolution in 2008, which called for a moratorium on DU's use and efforts toward a global ban[167]. This resolution was supported by 94% of MEPs. Alongside European efforts, a resolution calling for a regional moratorium on uranium weapons was passed in 2009 in the Latin American Parliament[168].

DU weapons have also been the subject of domestic bans in Belgium (2007)[169] and Costa Rica (2011)[170].

This sustained pressure has impacted on the MoD's attempts to maintain DU's acceptability. A notable example of the shift in strategy is explored in the case of the 'SCHER report' (p. 44).

Current position

The UK maintains a stockpile of 120mm L27 CHARM3 ammunition, as the primary anti-armour round for the Challenger 2 tank. The round is composed of two parts, the penetrator and the propellant charge. The propellant charge deteriorates over time and will expire in 2013.

159. MoD (2012) Reports from MoD depleted uranium workshops, FoI request. [Available at: www.whatdotheyknow.com/request/reports_from_mod_depleted_uraniu, last accessed: 1 Sep 2012]

160. Smith, B. (2007) The MoD Depleted Uranium Programme Independent Review Board: Closure Report, CR/07/065N, Natural Environment Research Council (NERC)p. i. [Available at: http://core.kmi.open.ac.uk/display/60463, last accessed: 1 Sep 2012]

161. Baverstock, K. (2011) Evaluation of the SCHER opinion on DU in 2010 [Available at: www.bandepleteduranium.org/en/meps-hear-criticism-of-european-commissions-deplet, last accessed: 1 Sep 2012]

162. Parrish, R. et al (2008) Depleted uranium contamination by inhalation exposure and its detection after 20 years: Implications for human health assessment in Science of The Total Environment, Vol. 390 (1) p.58–68.

163. Baverstock, K. (2011) Evaluation of the SCHER opinion on DU in 2010 [Available at: www.bandepleteduranium.org/en/meps-hear-criticism-of-european-commissions-deplet, last accessed: 1 Sep 2012]

164. The Royal Society (2002) The health hazards of depleted uranium munitions Part II, London, March 2002.

165. ICBUW (2012) United Nations [Available at: www.bandepleteduranium.org/en/united-nations, last accessed: 1 Sep 2012]

166. Early Day Motion 825, United Nations General Assembly Resolution on Depleted Uranium [Available at: www.parliament.uk/edm/2010-12/825, last accessed: 1 Sep 2012]

167. ICBUW (2012) European Parliament [Available at: www.bandepleteduranium.org/en/european-parliament, last accessed: 1 Sep 2012]

168. ICBUW (2009) Parlatino calls for a moratorium on uranium weapons, 21 Sep 2009 [Available at: www.bandepleteduranium.org/en/parlatino-calls-for-a-moratorium-on-uranium-weapon, last accessed: 1 Sep 2012]

169. ICBUW (2012) Domestic legislation [Available at: www.bandepleteduranium.org/en/domestic-legislation, last accessed: 1 Sep 2012]

170. ICBUW (2011) Costa Rica bans depleted uranium weapons, 28 Apr 2011 [Available at: www.bandepleteduranium.org/en/costa-rica-bans-depleted-uranium-weapons, last accessed: 1 Sep 2012]

171. For a detailed historical analysis of CHARM3 procurement see Cullen, D. (2012) Overstating the case: an analysis of the utility of depleted uranium in kinetic energy penetrators, ICBUW. [Available at: www.bandepleteduranium.org/en/overstating-the-case-an-analysis-of-the-utility-of, last accessed: 1 Sep 2012]

172. A rifled barrel is one that has grooves on its inside that spin the projectile when fired to improve its accuracy. Most modern tanks have a smooth barrel combined with a round that has 'fins' which enable it to spin.

The UK is in a problematic procurement *impasse* thanks to short-sighted development decisions dating back to the 1960s[171]. CHARM3 is a bespoke round which can only be fired from a rifled gun barrel[172]. The rifled barrel was a British invention. Due in part to an institutional unwillingness to accept that this British creation had been supplanted, the UK's DU round was specifically designed for the rifled barrel. As most other states use a smoothbore gun with which the UK round is incompatible, the export options are few and the round is no longer manufactured.

Similarly there are physical constraints barring the improvement of the existing rounds, for example increasing the penetrator length. Overall, replacing CHARM3 would require a major upgrade to the Challenger 2's gun, firing system and ammunition storage area. Such a project was initiated in the early 2000s but subsequently shelved in spite of trials with a non-DU round showing improved performance in 2005[173]. The potential reasons offered for the programme not going ahead include cost[174] and the discovery that the tungsten-nickel-cobalt alloy used in the German-made rounds was carcinogenic[175].

Has the MoD's public relations strategy over DU been successful? In spite of 40 years of effort, the answer is no. This was ably demonstrated by Prime Minister David Cameron in April 2011 during the debate over military intervention in Libya:

> **The Prime Minister:** *"I also agree with the Hon. Members who signed the amendment about the need to avoid the use of depleted uranium and cluster munitions. We do not use those munitions…I could not have been more clear that we do not use those weapons and are not going to use those weapons."*[176]

As the MoD has found, DU munitions elicit a predictable response in the public conscience. In automatically connecting DU with cluster munitions, which became subject to an international ban in 2008, Cameron was demonstrating their intrinsic unacceptability.

The MoD's strategy to counter this unacceptability has remained largely constant since the 1970s, even if the terms of the discourse have varied. They continue to defend DU using banal and poorly supported statements, such as:

> *"the MoD does not recognise there is a risk to health and the environment from the use of DU ammunition"*[177]

It is all done in order to deflect public and parliamentary opposition to a highly controversial weapon, which the MoD needs to fulfil a perceived capability gap. A history of questionable procurement decisions and engineering hubris has further reduced the MoD's options and left them doggedly defending indefensible munitions which they privately acknowledge to be acutely problematic. By refusing to recognise the potential risks from DU weapons, the UK government is also able to evade responsibility for costly decontamination and the potential humanitarian impact of the weapons.

173. Foss, C.F. (2011) UK/MBTs and medium tanks, Jane's Armour and Artillery 2011 – 2012, p.163.

174. Ibid.

175. Dstl (no date) A review of the Toxicology of Tungsten Based Heavy Metal Alloys, Dstl, MoD. [Available at: www.mod.uk/NR/rdonlyres/8062F2B1-6A9A-42F8-B819-17890CA9C5A0/0/tungsten_review.pdf, last accessed: 1 Sep 2012]

176. Cameron, D. House of Commons Hansard London: HMSO HC 21 Mar 2011: Column 705.

177. Lt. Col. Sonnex, P. to Pagano, J. (2011) Private correspondence, MoD ref: ACP-IHL-DU, 9 Nov 2011.

178. European Parliament (2012) Texts adopted, Global treaty to ban uranium weapons, 22 May 2008, Strasbourg [Available at: www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0233+0+DOC+XML+V0//en, last accessed: 1 Sep 2012]

179. Nick Harvey MP to Sajid Javid MP (2012) Private correspondence, MoD Ref: D/Min(AF)/NH MC01117/2012, 19 Mar 2012.

180. European Commission (2012) Public consultation on environmental and health effects posed by depleted uranium, Consultation/Calls [Available at: http://ec.europa.eu/health/scientific_committees/consultations/public_consultations/scher_cons_04_en.htm, last accessed: 1 Sep 2012]

181. ICBUW (2011) MEPs hear criticism of European Commission's depleted uranium risk assessment [Online][Available at: www.bandepleteduranium.org/en/meps-hear-criticism-of-european-commissions-deplet, last accessed: 1 Sep 2012]

182. Cullen, D. (2011) ICBUW's commentary on the Scientific Committee on Health and Environmental Risks (SCHER) Opinion on the environmental and health risks posed by depleted uranium (DU)

183. Baverstock, K. (2011) Evaluation of the SCHER opinion on DU in 2010 [Available at: www.bandepleteduranium.org/en/meps-hear-criticism-of-european-commissions-deplet, last accessed: 1 Sep 2012]

184. Ibid.

185. Nick Harvey MP to Sajid Javid MP (2012) Private correspondence, MoD Ref: D/Min(AF)/NH MC01117/2012, 19 Mar 2012.

THE 'SCHER REPORT': MOD SEIZES ON FLAWED EC RISK ASSESSMENT

In May 2008 the European Parliament passed resolution *P6 TA(2008)0233 - Global treaty to ban uranium weapons*. This resolution requested that the European Commission:

> "...commission scientific studies into the use of depleted uranium in all regions where European and international military and civilian personnel have been deployed."[178]

After its passage, the European Commission mandated its Scientific Committee on Health and Environmental Risk (SCHER) to assess new studies that had emerged noting the genotoxicity of DU. It later published its *Opinion on the Environmental and Health Risks Posed by Depleted Uranium* (hereafter the 'SCHER report'). Selected parts of its conclusions have been a new addition to the MoD's standard responses to parliamentarians and the public on DU[179]. This report, and calls from civil society and UNEP for a precautionary approach to DU munitions, appears to have triggered a new MoD discourse to maintain DU's acceptability focused on risk assessment terminology.

THE REPORT AND A CRITIQUE

SCHER sought to produce a risk assessment on DU by reviewing existing literature and their 'Opinion' was adopted in May 2010[180]. After publication, SCHER's methodology, analysis and conclusions were strongly criticised. Such was the level of concern that the SCHER's Chair was brought before the European Parliament's Security and Defence Committee (SEDE) in October 2011[181].

SCHER based its conclusion of limited risk on the argument that civilians are unlikely to be exposed to DU following combat operations. This conclusion was based on a study undertaken in Kosovo that assessed the levels of DU in the urine of its subjects. SCHER's Chair argued that the study included hundreds of subjects. In reality, while the study did have hundreds of subjects, the vast majority were German peacekeepers. Only 25 were Kosovar civilians. In addition, the process of how these civilians were selected – for example their proximity to a DU strike, was not made clear in the study's methodology[182].

At the SEDE hearing the report was challenged by Dr Keith Baverstock, formerly of the WHO, and the International Coalition to Ban Uranium Weapons (ICBUW). Baverstock and ICBUW argued that it was impossible for SCHER to undertake a risk assessment as all the parameters relating to DU's potential health impact are not known. This includes the dose response of different body tissues, civilian exposure levels and the characteristics of DU particles. Puzzlingly, SCHER had also failed to follow their own guidelines for the assessment of genotoxic substances[183]. Baverstock reasoned that SCHER had performed a risk management exercise and not a risk assessment[184]. Their conclusion was also based on the presumption that DU contamination could, and would, be managed after conflict. As we have seen, users of DU weapons have done little to justify this presumption.

As with UK DU policy, SCHER elected to ignore uncertainties. A more conscientious approach would have been to acknowledge and accept uncertainties and exercise precaution.

SCHER REPORT UTILISED TO MAINTAIN ACCEPTABILITY

Despite the severe limitations of the SCHER risk assessment, the MoD has used selected parts to justify the continued use of DU, as defence minister Nick Harvey noted in personal correspondence:

> "The European Commission, through a group of independent scientific experts taking into account potential pathways and realistic scenarios of exposure, concluded that "exposure to depleted uranium could not result in a detectable effect on human health."[185]

The report has also influenced the MoD's discourse on hazard and risk. In correspondence with a Member of the Scottish Parliament in 2011, former Secretary of State for Defence Rt. Hon. Liam Fox acknowledged that DU is not 'safe' and that it is a hazard[186]. In response to a call for precaution Fox notes that:

> "The precautionary principle you advocate is manifest in our approach to managing risk on the balance of likelihood and consequences."[187]

Fox went on to argue that studies on military personnel – that have not documented significant exposures - prove that DU use in conflict does not cause ill health. This fails to acknowledge the lack of civilian exposure data and the wildly different exposure scenarios.

Following SCHER and calls for a precautionary approach to DU, the MoD has used the risk/hazard discourse to maintain DU's acceptability. They present an air of responsibility by acknowledging that DU is a hazard but misrepresent the outcome and state of research in arguing that it is not a risk, or that it is less of a risk than other post-conflict hazards.

A more neutral analysis would instead note that DU is a hazard; that its uncontrolled and unpredictable release during conflict and the lack of effective post-conflict management increases the risk to civilians and that without civilian exposure data and health monitoring, these risks cannot be accurately quantified. Logic should then dictate that a precautionary threshold has been passed.

186. Rt. Hon. Liam Fox MP to Dr Bill Wilson MSP (2011) Private correspondance, MoD Ref: D/S of S/LF MC00767/2011, 22 Feb 2011.

187. Ibid.

CONCLUSION

"...major scientific uncertainties persisted regarding the long-term environmental impacts of depleted uranium, particularly with respect to long-term groundwater contamination.

"Because of these scientific uncertainties, UNEP called for a precautionary approach to the use of depleted uranium, and recommended that action be taken to clean up and decontaminate the polluted sites. It also called for awareness-raising among local populations and future monitoring."[188]

UNEP report to UN General Assembly, 17 September 2010

The UK's experience with DU weapons has raised several key issues, which are detailed below.

THE MOD'S NEGLIGENT ATTITUDE TOWARD HUMANITARIAN CONCERNS

During the 1970s, the MoD's attitude sidelined concerns from safety officials to gain approval for the development of a weapon they perceived as advantageous. Only after heightened public concern in the late 1990s did the MoD make efforts to investigate the impact of DU weapons. Significantly, the issue of civilian exposure to DU remains under-researched. As is noted in 1971 and again in 2007, the potential health and environmental impact of DU use should have been considered prior to its development and use.

In October 2011, questioning by Katy Clark MP revealed that the MoD had never reviewed the legality of the CHARM3 DU round under IHL, as was required under Article 36 of Additional Protocol 1 of the Geneva Conventions. Instead the MoD had been falsely claiming that the weapons had been reviewed and were 'used in accordance with IHL' to reassure parliamentarians and the public.

This indicates a negligent attitude towards the humanitarian concerns voiced by parliament and civil society over DU. Given the MoD's vested interest in maintaining the weapons in their arsenal this is perhaps unsurprising, nevertheless similar situations could be avoided with greater transparency and accountability within the MoD.

Some lessons from the DU experience seem to have been learnt – primarily that the public will not find radioactive and toxic conventional weapons acceptable. During the mid 2000s, research was conducted into less toxic alternatives to DU weapons[189]. However, it is unclear to what extent this concern was indicative of the MoD's fears over civilian health, whether it was driven by concern for their personnel or resulted from their bruising experience defending DU munitions.

188. UNEP report to UN General Assembly (2010) Effects of the use of armaments and ammunitions containing depleted uranium, Report of the Secretary-General, A/65/129/Add.1, 17 Sep 2010.

189. Dstl (no date) A review of the Toxicology of Tungsten Based Heavy Metal Alloys, Dstl, MoD. [Available at: www.mod.uk/NR/rdonlyres/8062F2B1-6A9A-42F8-B819-17890CA9C5A0/0/tungsten_review.pdf, last accessed on: 1 Sep 2012]

THE LIMITED EXTENT OF THE UK'S POST-CONFLICT OBLIGATIONS

The official government line has long been that post-conflict DU remediation work is the responsibility of the affected state. The public outcry that arose around DU's use during the Iraq invasion in 2003 forced the MoD to recognise a 'moral obligation' for clean-up. However in practice the UK failed to sufficiently fulfil this obligation. Expert organisations' recommendations for post-conflict clean-up, hazard awareness and environmental monitoring are yet to be fulfilled.

In wider disarmament politics, attempts have been made to codify state obligations for the post-conflict management of unexploded and abandoned weapons. Among them is Protocol V of the UN Convention on Certain Conventional Weapons (CCW). Amongst other things, this protocol establishes that it is the responsibility of the users of explosive weapons to assist with the clearance of unexploded ordnance. This protocol, signed, but not yet ratified by the UK, has set a precedent for state recognition of their responsibilities for post-conflict remediation.

In the case of toxic remnants of war, central to the debate is the extent to which proscribed actions or behaviours that would be deemed environmentally damaging in a state during peacetime are justified during conflict. If, as is likely, civilians bear the brunt of toxic contamination, should environmental health protection standards match those in the belligerent's state? Equally, what is the extent of a polluter state's obligations for environmental remediation after conflict?

THE MOD'S 'TRANSPARENT' PUBLIC RELATIONS STRATEGY

Since 1979 the MoD has attempted to manage the public and ministerial perception of DU through an aggressive public relations strategy. Public statements during the 1970s downplayed DU's hazards and avoided key issues of concern, even as the decision was made in private to not fire DU in training due to health and environmental fears.

The use of DU by the UK and US in the 1990s and 2000s produced an entirely predictable public backlash which created a major challenge for the MoD's public relations strategy.

The 1990s blanket dismissal of the risks changed during the early 2000s and was followed by a strategy of 'selective transparency and openness' after numerous reports highlighted that DU was problematic. This tactic of 'selective transparency' continues to this day, as can be seen in the ministerial statement regarding the completion of the belated Article 36 review into the legality of CHARM3 under IHL[190].

The current justification for DU use now utilises scientific uncertainty as a case for inaction. This new discourse, which recognises that DU is a hazard but argues that there is insufficient evidence of risk, is at odds with UK and EU environmental protection norms. These norms dictate that where there is evidence of potential harm, and where the best available science is unable to accurately quantify the precise risks, a precautionary approach should prevail. Calls from UNEP which have cited scientific uncertainty as a justification for a precautionary approach continue to be ignored.

DOES THE MOD'S INFLUENCE HIGHLIGHT A DEMOCRATIC DEFICIT?

The MoD has a vested interest in ensuring the ongoing use of DU munitions. In the debate over their acceptability they have sought, and still maintain, a highly influential role in the framing of UK DU policy. But is this morally acceptable? To what extent should the MoD's interests be balanced with humanitarian and environmental considerations and what mechanisms are in place to ensure that the policy shaped by the MoD is properly scrutinised?

The MoD's current and historical strategy suggests that DU munitions are intrinsically unacceptable to the British public. Similarly their use clearly runs counter to our domestic environmental and health protection norms. Yet on this issue the MoD remains largely unaccountable, both to parliamentary and civil society scrutiny.

190. Ministerial statement made by Nick Harvey in regards to the completion of the Article 36 legal review of CHARM3 and a response to it by CADU [Available at: www.cadu.org.uk/cadu/cadu-and-uwn-response-to-flawed-article-36-legal-r, last accessed on: 1 Sep 2012]

The use of DU weapons has raised questions of moral and political acceptability; questions that those with a vested interest are poorly placed to answer. A formalised mechanism through which humanitarian and environmental concerns over new weapons technologies can be raised and scrutinised as a counterbalance to military interests is urgently required.

This is an issue that is wider than the question of DU weapons; it relates to the numerous controversial weapons and military strategies that the UK Armed Forces employ. This must be addressed by government and civil society.

RECOMMENDATIONS

It is pertinent that the UK government:

1. **Accelerate efforts to remove DU munitions from the UK's arsenal.**
2. **Assess the potential humanitarian and environmental impact of toxic munition components.**
3. **Extend its precautionary approach to encompass civilian risk reduction and decontamination.**
4. **Reassess its approach to managing scientific uncertainty.**
5. **Create formalised mechanisms to provide greater scrutiny over MoD weapons policy.**

These recommendations are detailed in the Executive summary.

APPENDIX

UK MOD DU RESEARCH PROGRAMME OUTLINE REQUIREMENTS

Can be found in Appendix B of Smith, B. (2007) *The MOD Depleted Uranium Programme Independent Review Board: Closure Report*. Available at: http://core.kmi.open.ac.uk/display/60463

RESEARCH ITEM 1

RADIOCHEMICAL ANALYSIS OF DEPLETED URANIUM

REQUIREMENT – To;

- Carry out a detailed radiochemical analysis of the depleted uranium used in UK 120mm munitions to identify uranic and transuranic composition.
- Review the results of the radiochemical analysis and compare and contrast the results with those provided by the supplier of the raw material.
- Assess any additional risk to health posed by any unexpected trans-uranic material identified by the radiochemical analysis.

RESEARCH ITEM 2

DEPLETED URANIUM HAZARDS REFERENCE DOCUMENT

REQUIREMENT – To conduct parallel reviews of depleted uranium hazard literature (both classified and unclassified) by;

- Obtaining and reviewing Information on uranium and depleted uranium hazards published in the available source literature.
- Comparing and contrasting published depleted uranium hazard assessments based on information relating to depleted uranium's radiological and chemical toxicity, and extrapolations from uranium hazard data.
- Identifying areas where the quality of source information gives rise to uncertainties in the hazard assessments and define any new work that would give increased confidence in hazard assessments.

RESEARCH ITEM 3

CORROSION OF DEPLETED URANIUM

REQUIREMENT – To;

- Identify and characterise real depleted uranium corrosion environments.
- Conduct experimental work to compare and contrast corrosion and dissolution rates of unfired depleted uranium in ground, marine and controlled laboratory environments.
- A review of the literature relating to the bioavailability of the corrosion products of depleted uranium identifying any gaps in understanding.
- Review available data to establish if there is any evidence to justify determining the relative and actual corrosion and dissolution rates for both fired and unfired depleted uranium.
- Subject to the review indicating a requirement to conduct research using fired depleted uranium, obtain fired depleted uranium and conduct experimental work to compare and contrast its corrosion and dissolution rates in ground, marine and controlled laboratory environments

RESEARCH ITEM 4

DEPLETED URANIUM CONTAMINATION AT THE FIRING POINT

REQUIREMENT – To;

- Conduct a review of available data to establish the extent to which gun barrels used to fire depleted uranium munitions have become contaminated and to assess the hazard to health imposed by such contamination.
- Subject to the above assessment concluding that gun barrel contamination poses an unacceptable hazard to health, carry out work to establish the contamination mechanism.
- Assess the environmental consequences of gun barrel contamination.
- Assess the nature and extent of any contamination released into the environment, at the firing point, when using contaminated barrels to fire either depleted uranium or non-depleted uranium munitions.

RESEARCH ITEM 5

IMPACT EFFECTS

REQUIREMENT – To;

- Liase with the US depleted uranium research community to identify collaboration opportunities.
- Participate in US firing tests whenever an opportunity arises.
- Review available US and UK test firing data relating to impact effects and compare and contrast the findings with particular emphasis on an assessment of the relevance of the US data to UK DU usage.

RESEARCH ITEM 6

DEPLETED URANIUM TRANSPORT MODELLING

REQUIREMENT – To;

- Review existing methodologies for modelling uranium and deleted uranium transport in the environment and compare and contrast published transport model results.
- Assess the relevance of geochemical models of radioactive

material transport to the transport of depleted uranium in the environment and compare and contrast conventional and geochemical models and recommend the most appropriate for DU transport modelling.

- Identify where transport parameter values are uncertain and define the work needed to obtain the parameters required to increase confidence in model predictions.
- Subject to the outcome of the above work, determine those transport parameters required to increase confidence in transport model predictions.

RESEARCH ITEM 7

FATE OF DEPLETED URANIUM

REQUIREMENT – To:

- Continue ongoing studies of depleted uranium corrosion and dissolution in the marine environment.
- Review the available literature on the corrosion and dissolution of DU in the marine environment and compare and contrast published findings.
- Assess the implications of depleted uranium entering the marine environment on marine life and the food chain and identify any gaps in understanding.

RESEARCH ITEM 8

ENVIRONMENTAL IMPACT OF DEPLETED URANIUM

REQUIREMENT – To;

- Obtain and review the available information relating to the monitoring of UK and US depleted uranium test ranges and all sites where depleted uranium has been used in combat.
- Collate the available monitoring information, determine its value for assessing depleted uranium exposure in real events, identify what, if any, significant gaps in knowledge are preventing robust predictions of exposure based on monitoring data and, if appropriate, what research would be needed to increase confidence in exposure prediction.
- Obtain, review and collate any new information coming from the monitoring of depleted uranium test sites and combat zones and determine its value for assessing exposure of military personnel and civilians.

RESEARCH ITEM 9

HEALTH EFFECTS

REQUIREMENT – To;

- Review the available literature relevant to the effects of depleted uranium exposure by inhalation on neurocognitive functioning, pulmonary loading and transport to and uptake by the pulmonary lymph nodes, identify any uncertainties in understanding, determine if a scoping study on the dissolution rate of depleted uranium in lung fluids is needed to increase understanding and, if so, define a suitable study programme.
- Subject to the outcome of the above work, conduct a scoping study on the dissolution of depleted uranium aerosol in lung fluids.

RESEARCH ITEM 10

BIOKINETIC MODELLING FOR DEPLETED URANIUM

REQUIREMENT – To;

- Review work being done by the National Radiological Protection Board and others on biokinetic modelling related to uranic materials and assess its relevance to depleted uranium.

RESEARCH ITEM 11

POST DEPLOYMENT MONITORING OF DEPLETED URANIUM

REQUIREMENT – To;

- Assess the ability of instrumentation to locate depleted uranium penetrators and contamination in different depths of water and soil.
- Continue with in depth examination of accessible DU strike zones in the British Sector in Kosovo if monitoring data indicates that this is necessary.
- Continue with monitoring the living and working areas of UK service and civilian staff serving in Kosovo if monitoring data indicates that this is necessary.

RESEARCH ITEM 12

DEPLETED URANIUM LITERATURE

REQUIREMENT – To;

- Monitor and review future MOD depleted uranium research activities.
- Undertake a review of the scientific rigour of available historical and newly published depleted uranium literature and reports produced by reputable scientific bodies.
- Undertake a review of historical and newly published DU literature and reports produced by veteran and opposition groups.
- Maintaining and updating the DU database.