Opinion | *Doug Weir*

Toxic Remnants of War

The Case against Depleted Uranium Weapons

On 5 December 2007, the United Nations General Assembly passed a historic resolution highlighting health concerns over the use of depleted uranium (DU) munitions. The resolution — "Effects of the use of armaments and ammunitions containing depleted uranium" (A/62/30) — requests that the UN Secretary-General gather information from Member States and international organizations on the effects of depleted uranium weapons and report the findings to the 63rd session of the General Assembly (2008).[1]

The resolution, which was submitted by Indonesia on behalf of the Non-Aligned Movement (NAM), passed by a 136 to 5 vote (with 36 abstentions). The dissenters were the US, the UK, Israel, the Czech Republic and the Netherlands. (It later emerged that France had also tried to vote against the resolution but had suffered technical problems in the General Assembly chamber.)

While the wording of the resolution was weaker than that which the International Coalition to Ban Uranium Weapons (ICBUW), a non-governmental umbrella organization, had proposed, the positive response to the resolution provides an example of the momentum that is building for action to restrict the use of uranium in conventional weapons.

When the UN General Assembly takes up the issue of depleted uranium weapons in the fall, the discussions are likely to be contentious, and the reports called for in the resolution (which were submitted to the Secretary-General in May) will likely be challenged by key DU-user states such as the US, the UK and France, all of which are unwilling to accept that uranium weapons represent a toxic and radioactive battlefield hazard. (It is worth noting that the European Parliament, on 22 May 2008, also passed a resolution addressing DU weapons, requesting that Member States not use DU weapons, study their use and effects, and work towards an international ban on DU weapons if conclusive scientific evidence of their harm is found.)[2]

Depleted Uranium

Depleted uranium is waste from the uranium enrichment process that fuels civilian and military nuclear programs. Uranium naturally occurs as three different isotopes — U-234, U-235 and U-238 (from most to least radioactive).

After natural uranium has had most of the U-235 removed for nuclear fuel, it becomes "depleted." But in spite of the loss of much of the U-235, it still retains 60 percent of the radioactivity of natural uranium. Each kilogram of reactor-ready enriched uranium produced leaves behind approximately seven kilograms of waste or "tails" DU. There are more than a million tons of DU waste worldwide, usually stored as the hazardous gas uranium hexafluoride (UF_6). In the US, some of the tails DU has been contaminated with reprocessed uranium, or RepU. This is uranium that is recovered from nuclear reactors and contains man-made contaminants such as plutonium and U-236. DU shells used in munitions in the Balkans, for example, were found to be contaminated in this way.

IAEA/T. Cabianca

Testing for the Presence of DU in Kosovo
During a joint UNEP-IAEA mission a member of the UNEP team surveys trees for the presence of depleted uranium (Vranovac Hill, Kosovo, November 2000).

Depleted Uranium and Weapons

Depleted uranium is used in armor piercing munitions. Its very high density — it is 1.7 times denser than lead — gives DU weapons extra range and penetrative power. They belong to a class of weapons called kinetic energy (KE) penetrators, weapons that, instead of chemical explosives, rely on speed, hardness and density to pierce armor. The penetrators are solid darts produced in a range of calibers from 20mm to 120mm, the latter of which contain more than four kilograms of uranium. Other source materials for KE weapons include tungsten-nickel-cobalt composites, which are of a similar density and hardness.

Depleted Uranium and Health

One might think that the use of uranium's *least* radioactive isotope in weapons would not be overly contentious, certainly in comparison to other, more radioactive materials. But the uranium dust in DU weapons is in fact highly problematic because of three characteristics: its small size (which enables it to enter the deep lung and circulate throughout the body), its toxicity (which can affect multiple organs and systems), and its radioactivity (which actually increases over time). In combination, these three attributes present potentially grave threats to the health of people and the environment (and make DU very difficult to clean up, as well).

Small Particle Size. It is primarily the behavior of uranium once it leaves the barrel that is a cause for concern. Uranium is pyrophoric, which means it oxidizes rapidly when exposed to air; finely ground uranium can therefore spontaneously combust. As a penetrator speeds towards its target, friction with the air heats it up and, as it passes through the target, ablation occurs, releasing particles.[3] These ignite, filling the target with a burning cloud of uranium dust and fragments. This burning cloud may reach temperatures of more than 3000°C.

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These extremely high temperatures create particles of uranium oxide that are unlike those that have been studied in the past. (Past studies have focused on uranium ores in mine workings). What hazards these new particles present is largely unknown. In addition to uranium, the particles may also contain several other metals from the impact site. A sizeable proportion of these particles are micron or sub-micron sized and can be easily re-suspended and spread by winds or human activity. What is more, their small size allows them to be breathed in, enter the deep lung and from there travel around the body to the lymph nodes and beyond.

Chemical Toxicity. That uranium is chemically toxic — it is, after all, a heavy metal — is beyond dispute and has been studied since the 1940s, when interest in the Manhattan Project stimulated a wealth of research. These cellular and animal studies quickly indicated that uranium is a kidney toxin, neurotoxin, immunotoxin, mutagen, carcinogen and teratogen. More recently uranium has been shown to bind to DNA strands, where it causes oxidative damage through the generation of free radicals; while in mice, it has been shown to irreparably damage white blood cells and alter gene expression.

Radioactivity. In addition to its chemical toxicity it is important to consider DU as a constantly evolving mixture of radioactive elements. From the moment that U-238 leaves the enrichment centrifuge, it begins to decay. Because its half-life is a staggering 4.6 billion years, this allows a lot of time for transformations before it eventually becomes stable lead. At each stage of decay, U-238 discharges radioactivity, and it also transforms into thorium, protactinium, polonium and radon, among other things. In fact U-238 gets progressively and dramatically more radioactive as it ages.

The Use of DU Weapons

Uranium weapons were first fielded by the US and the UK in the Gulf War in 1991, then by NATO forces in Bosnia, Serbia and Kosovo, and again in Iraq by the US and the UK in 2003. The US also may have used DU in Afghanistan in 2001, although both the US and UK governments have strenuously denied this. (An analysis of the likely targets for US forces in the country supports their claim; attacking the lightly armored Taliban forces did not require the use of DU.)

In all, around 290,300 kilograms (kg) of DU munitions were used in the 1991 Gulf War, while NATO forces used a further 12,700 kg in the Balkans. By early 2004, US military sources estimated that an additional 140,000 kg had been used in Iraq. Much of this total was composed of 30mm penetrators fired from A10 Warthog aircraft and, unlike the 1991 conflict, a far greater proportion was used in civilian areas.

Civil society's understanding of the use of uranium weapons has been hampered by an instinctive lack of transparency from the military. This default position ensured that years went by before the locations of DU strikes were released to governments in the Balkans and Iraq.

The case against DU is deceptively simple: advocates argue that it is criminally negligent to contaminate battlefields with large quantities of radioactive and chemically toxic uranium oxide dust.

As one independent physicist noted during a recent ICBUW-sponsored UN workshop: "If this was a shampoo or cosmetic, it would be banned by now." Meanwhile, limited surveys and anecdotal evidence from frontline health workers in Iraq show an excess of the type of cancers that are often associated with environmental contaminants and radiation, such as lymphoma and leukaemia.

Once DU dust is released into the environment, there are few options available for remediation and clean up operations. And the onus for post-conflict clearance is almost always placed on the shoulders of the affected state's incoming administration, which is often in no position to be able to deal with the challenge presented.

Work towards a Treaty

In attempting to develop a treaty to ban the production, sale and use of DU weapons, activists are taking on DU users such as the UK and the US, as well as the arms and nuclear industries. Activists contend that low-level radiation is more hazardous to human health than claimed by its users, a position supported by the uncertainties inherent in estimating dose and exposure when radioactive particles enter the body. This stance is fiercely opposed by a well-connected nuclear industry with its sights set on a third generation of reactors.

When viewed alongside concerns over

heavy metal toxicity and nanoparticles, campaigners present a compelling argument in favor of the application of the Precautionary Principle.[4] When the challenge of collecting epidemiological data in hazardous post-conflict environments is also taken into account, it becomes a moral imperative that action be taken now to stop the future contamination of civilian areas.

The International Campaign to Ban Uranium Weapons

ICBUW was launched in 2003 by NGOs from the US, Europe and Japan. It numbers nearly 100 groups from 26 countries. Although inspired by the movements to ban anti-personnel landmines and cluster munitions, the campaign's focus is on toxic, rather than explosive remnants of war, an area with few controls under International Humanitarian Law (IHL). While controls exist against poisonous gases, radiological and incendiary weapons, DU weapons cannot easily be pigeon-holed into any of these categories, in spite of clear similarities to each at different stages of their use and impact. Uranium weapons are conventional weapons with unconventional effects.

While ICBUW has faced issues over the interpretation of IHL in the five years since its formation, perhaps the greatest challenge has been countering both DU weapon users, who deny their possible impact, and, ironically, some within the anti-DU movement itself, who make exaggerated claims about the purposes or effects of DU use.

In the wake of 9/11, a conspiracy-focused mindset seems to have influenced some supporters of disarmament movements. This has been fuelled by wild speculation to fill the gaps in our knowledge around the DU issue, speculation welcomed by those who instinctively wish to believe the worst — and what could be worse than radiation?

The ICBUW walks a path between two conflicting dogmas. On one side there is an alleged Western conspiracy to depopulate the oil rich regions of the earth through the use of radioactive weapons. On the other, a flat denial of the possible impact of uranium weapons on civilian populations and service personnel, a denial driven by a love affair with an ugly weapon. Both extremes must be rigorously challenged if we are to limit the long-term damage to human health and the environment caused by the military use of toxic and radioactive weapons.

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The following websites provide additional information about depleted uranium weapons: ICBUW (www.bandepleteduraniumorg) and the Committee Examining the Radiation Risk of Internal Emitters (www.cerrie.org).

Notes

1. The full text of General Assembly Resolution 62/30 (2007) can be found at http://daccessdds.un.org/doc/UNDOC/GEN/N07/465/PDF/N0746557.pdf?OpenElement.
2. The full text of the European Parliament's Resolution can be found at http://www.bandepleteduranium.org/en/a/181.html.
3. Ablation is the removal of material from an object's surface by vaporization, chipping or other process.
4. The Precautionary Principle is a "moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action" (Wikipedia).

US-India Nuclear Deal (continued from page 1)

IAEA and NSG Involvement

To implement the deal, further steps must be undertaken. The 35-member International Atomic Energy Agency (IAEA) Board has to approve an unprecedented safeguards agreement that would cover a limited number of additional Indian "civilian" reactors. Then, the 45-nation Nuclear Suppliers Group (NSG) must agree by consensus to exempt India from longstanding NSG guidelines that require full-scope IAEA safeguards as a condition of supply. Only if the NSG exempts India can individual states go forward with bilateral nuclear trade deals.

Nearly three years after President George W. Bush and Prime Minister Manmohan Singh proposed the nuclear deal, the arrangement is being buffeted by criticism at home and abroad. Even if the initiative doesn't crumble as a result of domestic Indian opposition in the next months, it will likely be stalled or significantly modified. Why? While many NSG Member States support India's legitimate nuclear energy goals, the terms proposed by India and the US go far beyond what many of them are willing — or should be asked — to accept.

India's Terms

The Singh government is seeking unprecedented "India-specific" safeguards that it says shall apply only so long as foreign supplies continue. Although P.M. Singh reiterated India's support for a nuclear test moratorium, the US-Indian nuclear cooperation agreement fails to explicitly state that renewed Indian testing would lead to a termination of nuclear trade. To improve its fuel production and spent fuel reprocessing capabilities, India wants access to enrichment and reprocessing technologies from the United States and other nuclear suppliers for its long-planned fast-breeder reactor program. Such technology, however, could also be used to improve its military nuclear program.

While it is for India to decide what is best for India, other states are under no obligation to agree to India's terms. In fact, the 189 states that are party to the nuclear Non-proliferation Treaty have taken on solemn legal and political responsibilities that: 1. bar them from providing any form of assistance to another state that might support a military nuclear program and 2. oblige them to support nuclear disarmament initiatives — responsibilities that make it difficult for them to agree to India's preferred terms of nuclear trade.

Under Articles II and III of the NPT, Member States are legally bound to support effective and permanent safeguards against the diversion of technology that might also be helpful in the making of nuclear bombs or bomb material. Under Article VI, they are all legally bound to support measures that would help end the arms race and lead to disarmament. These include the Comprehensive Test Ban Treaty (CTBT), which 178 states, including the original five nuclear-weapon states, have signed.[1] India refuses to sign. Under Article VI, NPT states are bound to pursue a halt to the production of fissile material for weapons purposes.

While P.M. Singh's restatement of India's support for the negotiation of a global fissile material cutoff treaty (FMCT) is positive, it is not a new or meaningful pledge. India has for several years stated its support for the negotiation of a global, verifiable FMCT. But negotiations toward such a treaty have been deadlocked since the late 1990s.[2]

NPT Member States must also consider the very real possibility that the supply of nuclear fuel to India could free up its existing (and limited) stockpile and capacity to produce highly-enriched uranium and plutonium for weapons. This could allow for the rapid expansion of India's nuclear arsenal from the current rate of some 6-10 bombs annually to several dozen annually. As a result, the United States and other nuclear fuel suppliers could be indirectly assisting India's nuclear bomb program in violation of their obligation under Article I of the NPT.

Furthermore, India's failure to agree to halt its production of fissile material for weapons (as four of the five original nuclear-weapon states claim to have done and as China is believed to have done) strikes many states as inconsistent with it policy of maintaining a "minimal credible deterrent."

These are real and legitimate concerns that should not be dismissed as unreasonable demands issued by states that would deny what many nuclear nationalists in India believe is a "right" to join the few nuclear weapons "haves." Rather, these are concerns based on the concept that all states should comply with a common set of nuclear weapons restraint measures and that no single state, or group of states, should have a "most favored" nuclear weapons status.

The nuclear deal would provide India nuclear trade benefits reserved for countries that have forsworn nuclear weapons or those legally bound to give them up; neither of which is true of India. The US-Indian deal is not an effective way to restructure the NPT system and would lead to the further unraveling of the basic security bargain established between the nuclear haves and have-nots.[3]

Thankfully, most NSG states appear reluctant to make far-reaching exceptions to international nuclear non-proliferation practices, and many rightly believe that India should in the very least abide by the same nuclear restraint measures that are expected of other major nuclear states.

The Way Forward

What can be done? If the proposal is advanced later this year or next, the NSG should reject India's demand for a "clean" exemption from NSG guidelines. At a minimum, NSG members should insist upon the minimal but still vital requirements established by the US Congress with regard to permanent safeguards, the consequences of nuclear testing, and restrictions on the transfer of enrichment and reprocessing technology. If NSG states take their non-proliferation obligations seriously, they should apply further conditions and restrictions than were adopted by the US Congress and take action in six key areas:

First, with respect to the **new safeguards agreement with the IAEA**, which is almost purely symbolic and hardly worth its 10 million dollar or more annual price tag, the IAEA Board should reject any Indian statement or interpretation that makes the safeguards contingent on the continuation of foreign fuel supplies. Such a contingency runs counter to the principle of permanent safeguards.

Second, India pledged in July 2005 to conclude an **Additional Protocol** to its safeguards agreement. NSG states will likely insist that India and the IAEA conclude a meaningful Additional Protocol before any India-specific NSG exemption takes effect. So far, neither the Indian nor the US government has explained how or when such a protocol will apply to Indian nuclear facilities.

Third, NSG members should insist that an **exemption from the full-scope safeguards requirement would be automatically revoked** in the event of a nuclear test explosion.

Fourth, India is seeking an exemption from NSG guidelines that would open the way for other nuclear suppliers to transfer sensitive plutonium reprocessing, uranium enrichment, or heavy water production technology to India. This should be a red flag to NSG states because IAEA safeguards cannot prevent such technology from being replicated and used in India's weapons program. At the moment, the vast majority of NSG members support a proposal for a new NSG guideline that would **bar transfers of these sensitive nuclear technologies** to non-NPT members. This would exclude India from NSG supplies of enrichment and reprocessing items.

Fifth, NSG states should flatly **reject India's attempts to secure nuclear fuel supply guarantees** for the lifetime of their reactors to overcome the possibility that foreign suppliers might cut off nuclear trade if India decides to resume nuclear testing or violates its safeguards agreement.

Finally, NSG states must also take their **NPT and UN Security Council commitments seriously**. In keeping with the Article VI requirement on all NPT states to support measures that would help end the arms race and lead to disarmament, they should reiterate the call in UN Security Council Resolution 1172 (1998) that calls upon India to reconsider and sign the CTBT and, along with Pakistan, halt fissile material production for weapons.

It is vital that responsible members of the NSG insist upon guidelines for trade with India that, at the very least, incorporate the minimal requirements mandated by US law, and ideally, go further to minimize the damage to the already beleaguered global non-proliferation system.

Based on recent conversations with NSG diplomats, I am fairly confident that many of these recommendations have broad support within the NSG. As a result, the proposal will have to be substantially modified and conditioned if it is to gain approval. If India's leaders cannot even abide by these minimal standards and decide to reject the deal, that is their choice. However, before they do, they should consider whether continued fissile material production, the option to test again, access to reprocessing and enrichment technology, and special safeguards are worth the cost of losing access to international fuel supplies and power reactors.

A careful and sober examination of these questions suggests that the purported security benefits of expanding and modernizing India's nuclear weapons arsenal and the economic benefits of reprocessing spent nuclear fuel are illusory and their costs are high. Given India's laudable past efforts and calls for a nuclear-weapon-free world, it is also unfortunate that the US-Indian nuclear cooperation proposal has not prompted deeper thinking and discussion within India about the role of its nuclear weapons and why it needs any greater capability.

To this day, Indian politicians cite former P.M. Rajiv Gandhi's visionary 1988 proposal for nuclear disarmament as a blueprint for action.[4] Realizing its goals will take more than just talk on the part of India's leaders. It requires leadership by example. While the US and Russia have undertaken several of the "phase I" steps in the Gandhi plan, India now resists two key elements of the plan: the CTBT and a "cessation of the production of nuclear weapons by all nuclear-weapon states." If India were to offer its support for these initiatives, its reentry into the international civil nuclear energy market would be wholeheartedly welcomed.

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Notes

1. While 178 states have signed the CTBT (signaling their intent to ratify the treaty), 144 of those have ratified it. China and the US have not ratified.
2. See Zia Mian, "Towards a Fissile Materials Ban," *Disarmament Times* (Spring 2007).
3. For further discussion of this issue see Ray Acheson, "The Challenges of Non-proliferation" (page 1 of this issue of *Disarmament Times*).
4. Read the proposal in its entirety at www.indianembassy.org/policy/Disarmament/disarmIs.htm.