EN

EUROPEAN PARLIAMENT

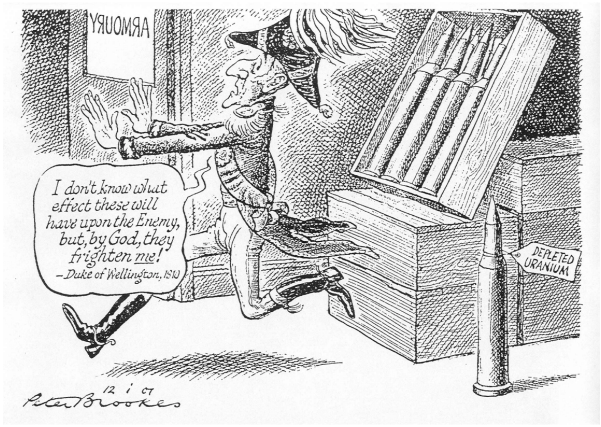
Directorate General for Research-Directorate A

STOA - *Scientific and Technological Options Assessment*

Briefing Note N° 03/2001

PE nr. 297.560 *January 2001*

DEPLETED URANIUM MUNITIONS



The use of Depleted Uranium (DU) weapons has become a very controversial issue as a result of allegations that it has caused illness in troops who were exposed to it during the Gulf War and the Kosovo action by NATO as well as harm to civilians who have come into contact with it since. The use of DU in artillery shells by US and British forces in Kuwait/Southern Iraq during the Gulf War in 1991, by US Forces in Bosnia in 1995 and by US air forces in Kosovo in 1999 is alleged to have resulted in illnesses among troops who took part in the Gulf War, among civilians in southern Iraq and among civilians in Bosnia and Serbia and Kosovo. It is claimed for example, that in the UK 521 Gulf War veterans have died since the 1991 conflict and that 5000 are suffering illnesses including leukaemia.

What is Uranium and what is Depleted Uranium?

Uranium is one of the densest elements known, 1.7 times more dense than lead. It is naturally radioactive. Natural Uranium is made up of a number of isotopes. 99.274% is U^{238} , 0.720% is U^{235} and 0.006% U^{234} . Enriched uranium is used as fuel in nuclear reactors, highly enriched uranium is used in nuclear weapons. Enrichment involves increasing the proportion of U^{235} to between 3.2 and 3.6%. For nuclear weapons enrichment is much more intense, to more than 90% U^{235}.

What is left behind from the enrichment process is poorer in U^{235} and in U^{234} and is therefore known as **Depleted Uranium.**

DU is also produced as a by-product of reprocessing, whereby fuel rods used in nuclear reactors are re-processed to provide plutonium for use either in fast reactors or in nuclear weapons. **DU** for munitions manufactured in the UK and France is imported from the USA, although both countries have large stocks of **DU** themselves. It has been suggested that the USA may supply a "special" **DU** of unknown composition.

DU has two properties that interest the military. It is extremely dense and can penetrate tank armour (it can also be used as tank armour). It also has the useful property of burning very fiercely when it does so, thereby more or less vaporizing the crew of a tank hit by such a shell.

In the Gulf War, the allies were faced with dug-in Iraqi tanks, mainly older Tu 54 and 55's, manned by ordinary Iraqi soldiers and these tanks could be despatched easily with conventional armour.

Saddam Hussein's so-called "Republican Guard" had the more modern T72 tanks and it was left to the Americans to despatch these using Abrams M1A1 tanks and "Warthog" aircraft, using considerable quantities of **DU** ammunition.

How dangerous is Depleted Uranium?

-Toxicity.

Natural Uranium, like lead and cadmium, is chemically toxic. If ingested or inhaled, soluble **DU** is dissolved in the body's fluids and transported via the bloodstream. Dissolved Uranium may react with biological molecules and exert acute toxic effects. In high doses it can cause death of kidney cells and atrophy in the tubules of the kidneys. However, about 90% of Uranium present in the bloodstream is excreted via the kidneys in urine within 24-48 hours. The 10% which remains can be deposited in bone, lungs, liver, fat and muscle tissue and may lead to long-term health effects.

-Radioactivity

DU is also about half as radioactive as Uranium, emitting α particles as it decays into the other elements of its radioactive series, which themselves also emit α as well as β radiation.

Holding a lump of Uranium in your hand is not likely to pose any risk at all, indeed Queen Elizabeth in the UK was given a lump of it to hold when she visited one of the first nuclear power stations in the UK. α radiation is easily stopped - a sheet of paper will block it.

However, when **DU** shells detonate, they create a dust of ceramic-like fragments which are particularly insoluble. If the **DU** munition impacts a solid object (which of course it is designed to do), then Uranium Oxide dust and DU particles are left in the area of impact and there is therefore a risk of ingestion or inhalation.

Inhalation or ingestion of insoluble **DU** particles is dangerous, precisely because, once in the body, they can lodge and remain there for a long time.

Although not highly radioactive, the α radiation inside the body, with no barrier to stop it, can penetrate individual cells and cause genetic changes to DNA, although recent controversial claims that such DNA damage may effect neighbouring cells, even those beyond the range of the α particles are regarded sceptically by the scientific establishment.

There is a danger that such DNA changes could eventually lead to cancer. Inhaled particles usually lodge in the lungs, raising the risk of lung cancer as a result of the unshielded radioactivity inside the body. The charge that **DU** inhalation or ingestion has produced cases of leukaemia is possibly explained by the fact that white blood cells scavenge the **DU** particles in the lungs and deposit them in the tracheobronchial lymph nodes, part of the immune system. The emission, within the lymph nodes, of local α and β radiation could damage blood stem cells over long periods, causing leukaemia.

Because of the danger posed by **DU** dust and fragments, allied tanks mistakenly fired upon with **DU** rounds by allied troops were shipped back to nuclear waste facilities and dumped.

This of course did not happen to enemy tanks, which, in the case of the Gulf War, remain in the desert. In the case of Kosovo, **DU** munitions remain in areas which are accessible to civilians, in particular children.

Depleted Uranium being a waste product of the uranium enrichment procedure, there is rather a lot of it about. The USA alone has produced 700 million kilogrammes of **DU**. Recent and very disturbing disclosures have revealed that some of the USA stockpiles of **Depleted Uranium** (and ammunition made from them) contain Plutonium and Neptunium, two elements of much higher toxicity and radioactivity than **DU** itself.

This needs to be investigated as it could explain the incidence of leukaemia. Plutonium, Neptunium and other heavy elements behave in different ways and are more radioactive. In particular certain elements, such as Strontium and Caesium, close to Calcium would tend to accumulate in bone. However, so far there is no evidence of the presence of such elements in **DU** munitions.

When a **DU** shell hits a target, US Army research has shown that between 10 and 70 percent of the shell oxidizes. Most of the oxide particles (less than 5 microns) are respirable and insoluble. The

dust created by a shell impact (roughly 0.5 to 3 kg per 120mm tank round) is scattered mainly in and on an area within 50 metres of the target, although some particles can remain suspended in the air for hours and travel downwind. Satellite observation during the Gulf War showed DU particle dust in the atmosphere at a height of 2 km and 100km downwind from the site of explosions. A recent study has found that electro magnetic fields found, for example, near high tension power lines, concentrate pollutants, including α particles.

A total of 290 tonnes of **DU** was used in the 1991 Gulf War and 8.4 tonnes in Kosovo in 1999, although one particular aspect of the Kosovo action by NATO is that not many Serb tanks were actually impacted, causing oxidization and fragmentation. Nonetheless, the UN Environment Programme reported in January 2001 that some bomb sites are still radioactive. It is claimed that Geiger counter measurements of **DU** sites in Iraq produced 24000 beats/second compared with a natural background radiation of 4 beats/second.

The USA code of conduct for the use of **DU** ammunition fails to adequately protect soldiers from exposure, withholds warnings from civilian populations and neglects the clearing up of **DU** ammunition from battlegrounds after the conflict.
In the case of Kosovo it must be added that warnings to the civilian population were forbidden by the Serbian government.

In the 1995 Bosnian conflict, where Serb communities have seen unusual rates of leukaemia, Biljana Plavsic, the former Republika Srpska President, who has recently been arraigned before the Court of Human Rights, forbade warnings to the population about DU munitions.

Testing of alleged victims.
It is not easy to test for **DU** as opposed to ordinary Uranium, which is present in earth and therefore part of the natural environment. Distinguishing between the two requires the use of sophisticated mass spectrometry. Nonetheless, testing is going ahead, both on the basis of comparison of total Uranium levels in soldiers who have been on active service in the Balkans and the Gulf, compared with those who have not, and on the basis of mass spectrometry, once the precise method has been determined.
In the USA, Dr. Asaf Durakovic, a Professor of Radiology at Georgetown University in Washington, claims to have found that 17 veterans of the Gulf War still have high levels of depleted Uranium in their bodies nearly a decade after the end of the conflict. On the other hand, NATO, the USA and Britain insist that **DU** is safe. The US Department of Defense reported last month that of 33 soldiers exposed to DU in the Gulf, only the 15 who still had shrapnel in their bodies had more Uranium in their urine than normal, and they had no related health problems.

The problem with urine testing is that it cannot show microscopic particles which have lodged elsewhere in the body, such as the lymph nodes. There have been no chemical autopsies of the servicemen who died of leukaemia to test for the presence of radioactive particles in the lymph nodes.
Unusual levels of illness seem to have affected veterans of the 1999 Kosovo campaign, 17 of whom died from leukaemia.

Response of NATO and governments.
The reaction of NATO and of member state governments was initially defensive, but has moderated in the face of intense questioning and criticism. Belgium,France,Greece,Italy, Portugal and Spain as well as the EU Commission have called for an inquiry into the use of DU munitions, and some were quick to send scientific teams to test sites in Kosovo and to test their own troops. Other NATO members, the USA and the UK in particular, have tried to play down fears by evoking scaremongering by the press. In the UK attempts to do this have somewhat backfired since reports by the Ministry of Defence's own

scientists ten years ago warning of such effects have been made public.

Since these revelations, NATO has now called for tests on troops of all 19 NATO members.

It is fair to say that the credibility of some member state governments on issues where there may be a question of compensation (be it aircrashes, nuclear risk, BSE, or whatever) has been somewhat strained in recent years and that the public is very sceptical of reassurances by government scientists and ministers.

Risk models for radiation exposure.
Risk models for exposure to radiation were developed at the start of the Cold War and based upon observations made in the aftermath of the nuclear explosions at Hiroshima. They assume uniform exposure over the whole body and are regarded by some scientists as totally out-of-date and inaccurate. **DU** exposure is concentrated and therefore exposure may not be measurable in terms of the ICRP assumptions. For Chernobyl, it is believed that the model has an error factor of 100.

EU Institutions and Depleted Uranium

Depleted Uranium ammunition is not a matter for which the European Communities have responsibility, except in so far as the largely moribund Euratom Treaty provides for nuclear safeguards and health and safety regulations for workers in the nuclear industry. Health and safety Directives limit the exposure of patients and medical staff to radiation from x-ray equipment.

It is stretching a point to consider applying these provisions to soldiers in wartime outside of EU territory.

However, the failure of NATO to clear up **DU** munitions from sites of conflict, allegedly leading to unusually high cancer rates in civilian populations has caused some commentators to accuse NATO itself of having committed war-crimes.

The European Parliament

EP Questions to the Commission on **DU.**

2445/93 by Alex **Smith**. "Test firing of **DU** shells"

2446/93 by Alex **Smith**. "Export of **DU**."

2447/93 by Alex **Smith.** "Health and environmental risks of **DU**."

2448/93 by Alex **Smith**. "**Depleted Uranium** shells."

2415/94 by Alex **Smith**. "**Depleted Uranium** stores."

0658/96 by Alex **Smith**. "Hazards of **DU**."

41/99 by Alexandros **Alavanos**. "Report on use of **DU** bombs by USA in Yugoslavia."

29/99 by David **Bowe**. "**DU** weapons."

The European Parliament has recently (January 2001) called for an end to the use of all **DU** ammunition by NATO.

Sources.

New Scientist, 13.1.01
The Times January
The Independent, January
"The use of depleted Uranium in Ammunition"
by Dan Fahey, Military Toxics Project, Dec 1999.
Süddeutsche Zeitung, 5/6 Januar 2001

Collaborators: ***Graham CHAMBERS***, **Theo KARAPIPERIS, Gordon LAKE, Peter PALINKAS, STOA Unit**

STOA
European Parliament
L-2929
LUXEMBOURG
Fax: (352) 4300 27718

Rue Wiertz 60
B-1047 BRUSSELS
Fax: (32) 2 2844980