RAS 14509

Army Anagnostopoulos Exh. # 1-H

[Originally Attached As EXHIBIT HWA # 9 to Witness Anagostopoulos' pre-filed testimony]

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of US ARMY (JEFFERSON PROVING GROUND)

Docket No. 40-8838-MLA Official Exhibit No. ARMY EXH. # 1-H

OFFERED by: Applicant/Licensee Intervenor ______

NRC Staff Other ______

IDENTIFIED on ______ Witness/Panel ______

Action Taken: ADMITTED REJECTED WITHDRAWN

Reporter/Clerk ______

Depleted Uranium in Kosovo, Post-Conflict Environmental Assessment, United Nations Environment Programme, Nairobi, Kenya, 2001. (section 2.2, page 15)

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TEMPLATE = SECY-028

SECY-02

UNEP

Depleted Uranium in Kosovo

Post-Conflict Environmental Assessment

and the environment arising from possible use of depleted uranium during the 1999 Kosovo conflict. A preliminary assessment' (UNEP, 1999).

In July 2000, following approaches from the United Nations Secretary-General, NATO made available a detailed list of sites where DU had been used. UNEP then moved quickly to assemble a team of international experts to prepare a scientific mission to Kosovo. The mission itself took place from 5 – 19 November 2000.

2.2 Depleted uranium

What is depleted uranium?

Depleted uranium (DU) is a by-product of the process used to enrich natural uranium ore for use in nuclear reactors and in nuclear weapons. It is distinguished from natural uranium by differing concentrations of certain uranium isotopes. Natural uranium has a uranium-235 (abbreviated as U-235 or 235U) content of 0.7%, whereas the content of U-235 in DU is depleted to about one-third of its original content (0.2 – 0.3%).

One penetrator (right) and two penetrators still fixed in their jackets. The left penetrator has partly moved from its position in the jacket. The length of the penetrator is 95 mm.

Like natural uranium, DU is an unstable, radioactive, heavy metal that emits ionizing alpha, beta and gamma radiation. Because of its radioactivity the amount of uranium in a given sample decreases continuously but the so-called half life (the period required for the amount of uranium to be reduced by 50%) is very long – 4.5 billion years in the case of the isotope uranium-238 (U-238 or 238U). In practice, therefore, the level of radioactivity (which is meas ured in units per second known as 'becquerels' – Bq) does not change significantly over human lifetimes.

The UNEP studies in Kosovo showed that the material in the DU penetrators found there also contained traces of transuranic isotopes such as uranium-236 and plutonium-239/240 which are created during nuclear reactions. This indicates that at least part of the material in the penetrators had originated from the reprocessing of nuclear fuel. However, the amounts of these isotopes were very low and not significant in terms of the overall radioactivity of penetrators.

The applications of DU and its use during the Kosovo conflict

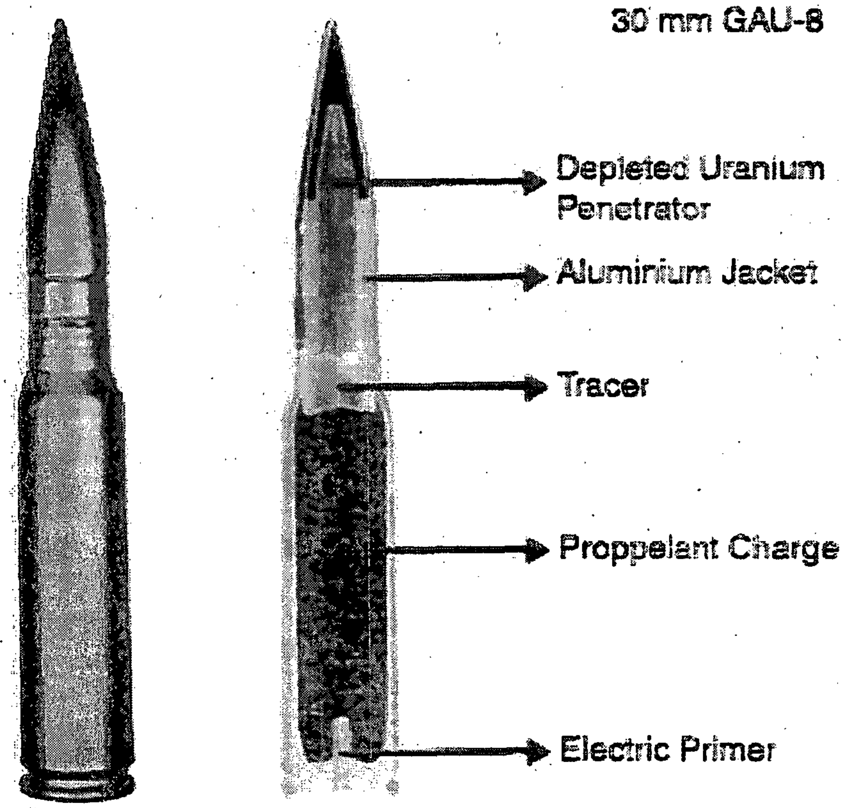
DU has been used for civil and military purposes for many years. The civil applications include use in radiation shielding and aircraft ballast. Because of its high density (19.0 g/cm^3) and resistance, DU also has major military applications, particularly in defensive armouring for tanks and other vehicles. However, the properties of DU also make it ideal for offensive use in armour-piercing munitions. Both tanks and aircraft can fire depleted uranium munitions, with tanks firing larger calibre rounds (100 and 120 mm) and aircraft smaller calibre rounds (25 and 30 mm). During the Kosovo conflict, DU weapons were fired from NATO aircraft, and it has been reported that over 30,000 rounds of DU were used (UNEP, 2000).

Characteristics and behaviour of DU anti-armour rounds fired by A-10 aircraft

The type of DU round fired by NATO A-10 aircraft has a length of 173 mm and a diameter of 30 mm. Inside the round is a conical DU 'penetrator', 95 mm in length and with a diameter at the base of 16 mm. The weight of one penetrator is approximately 300 g. The penetrator is fixed in an aluminium 'jacket' (or 'casing') 60 mm long and 30 mm in width. When the penetrator hits an armoured vehicle, the penetrator continues through the armouring, but the jacket usually remains outside. The A-10 aircraft is equipped with one gattling gun capable of firing 3,900 rounds per minute. A typical burst of fire occurs for two to three seconds and involves 120 to 195 rounds. These hit the ground in a straight line, one to three metres apart, depending on the angle of the approach, and cover an area of about 500 m^2. The number of penetrators hitting a target varies with the type of target, but does not normally exceed 10% of the rounds fired (CHPPM, 2000).

Penetrators that hit either non-armoured targets, or miss targets, will generally remain intact, passing through the target and/or becoming buried in the ground. The depth depends on the angle of the round, the speed of the plane, the type of target and the nature of the ground surface. In clay soils, penetrators used by the A-10 attack aircraft may reach more than two metres depth. Conversely, penetrators hitting hard objects such as rocks and stones may ricochet and be found lying on the surface some distance from the targeted area.

PGU-14 API (Armour Piercing Incendiary)



Normally 10-35% (maximum of 70%) of the round becomes aerosol on impact with armour and the DU dust catches fire (Rand, 1999). Most of the dust particles are < 5 μm in size, and spread according to wind direction. DU dust is black and a target that has been hit by DU ammunition can be recognised by the black dust cover in and around the target (U.S. AEPI, 1994). The DU dust formed during the penetration of armoured vehicles can be dispersed into the environment, contaminating the air and the ground. However, such contamination should be limited to within about 100 metres of the target (CHPPM, 2000). It is important to note that hits on non-armoured ('soft') targets do not generate significant contamination because the DU penetrators do not generate significant amounts of aerosols on impact.

Small penetrator fragments and DU dust are gradually transported into the upper soil layer by water, insects and worms. Wind, rainwater, or surface water flow may also redistribute the dust. Due to the varying chemical properties of different soils and rocks, the effects of buried penetrators on the environment will also vary. The mobilisation of DU in the soil profile and its possible contamination of groundwater will depend on a range of factors such as the chemistry and structure of the surrounding soil, rainfall and hydrology.