Uranium Coverup 03/21 - Uranium hazards

Uranium properties and military non-nuclear applications

Counting only uranium isotopes, uranium ore contains 99.3% U-238, 0.7% U-235 and traces of U-234. DU metal is depleted of U-235 down to about 0.2%, hence the name.

The rest is U-238 and traces of U-234. The combined radioactivity of DU is about 40% less than in the natural mix of uranium isotopes. References on DU weapons describe physical properties of the metal as if other metallic forms of uranium differed. This is true for uranium alloyed with other metals that can significantly alter the original properties, but not for the uranium isotopes. For example, a mix of 99.3% U-238, 0.7% U-235 and trace quantity of U-234 would have the same physical properties as DU, but would be difficult to detect, since the ratio of uranium isotopes, the prime detection parameter for DU, would be similar to that in nature.

At 19.1 g/cm3, uranium has an advantage over slightly denser tungsten, which is not as abundant and very expensive. The nuclear industry has hundreds of thousands tons of waste DU to dispose of after U-235 has been extracted. For the US arms makers, who obtain enrichment byproduct uranium free of charge, DU opened an opportunity. The first non-atomic weapon that employed DU was the “silver bullet”. At a high speed of impact, bullet’s density, hardness and flammability enable penetration into heavily armoured targets. Tungsten does not ignite as easily and is 1.75 times harder, which together with a much higher melting point, makes it more difficult to work with, compared to DU. Alloying with 0.75% titanium increases hardness of DU anti-tank penetrators. Manufacturing processes e.g. heat treatment and forging, determine DU's strength and fragmentation qualities.

The applications of armour-piercers range from 20 mm Phalanx gun in the navy for piercing attacking missiles, through 30 mm gun in A-10 aircraft, to 105 mm and larger tank barrels. Tank armour and removable armour of combat vehicles are hardened with DU plate. Many countries, industrialized and poor, make and use the DU bullets and armour.

Significantly more uranium than in DU bullets would be used in weapons developed under a Hard or Deeply Buried Target Defeat Capability (HDBTDC) programme launched by the US military in the mid 1990s [www.fas.org/man/dod-101/sys/smart/hdbtdc.htm]. The weapons must be able to penetrate targets in hardened buildings, or underground. This can be accomplished with a high density penetrating warheads with smart fuses that delay detonation until the weapon is in the desired space, for example, on the lowest level of a multi-level concrete building. The weapons also need to neutralize chemical and biological agents before they escape into the environment, by using incendiary warheads.

Owing to its density, uranium – depleted or not – can double the penetration power relative to older weapons. Currently, over 20 weapon systems against hard and buried targets, stocked for imminent “wars on terror”, are most likely made of uranium. New versions are under development and testing. The biggest of them, Big BLU, contains several tons of a “dense metal” in the penetrator alone. The mysterious metal must be uranium, since as dense and harder tungsten would be prohibitively expensive, less workable and not readily ignitable. Dr. Asaf Durakovic measured very significantly higher levels of uranium in Afghanis near targets hit by penetrating bombs and missiles. His team noticed the weapons punched through several concrete floors and walls, then buried 3 to 4 meters in the earth before exploding. [www.umrc.net]. Were they used in foreseeable war scenarios, the weapons would produce contamination levels significantly higher than from DU bullets in the Gulf War.

For its pyrophoric properties, i.e. spontaneous burning in air when in fine form (swarfs, metallic dust), uranium in an incendiary warhead could be effective in neutralizing biological or chemical weapons facilities hidden underground or in concrete structures. Powdered uranium could be the incendiary agent in the last stage of a warhead in a penetrating weapon cased or ballasted with uranium. The incendiary warhead would add its mass to the weapon's penetrating impact.

The shaped charge technology also employs uranium. By focusing explosives in one direction e.g. by containing them with a conical or concave hemisphere metal liner, detonation compresses and squeezes the liner forward, forming a jet of molten metal traveling as fast as 10 km/s. Jane's website indicated some time ago that DU was used as "liners in shaped charge warheads". Guided weapons ranging from Maverick and Hellfire missiles to torpedoes, sub-munitions in cluster bombs and the first stage of BROACH MWS warheads use this technology. At his website Williams provides an in-depth, up-to-date review of both the HDBTDC and shaped charge weaponry.

DU is used in counterweights of military aircraft. Civilian aircraft gradually abandon the use of DU weights in favour of safer tungsten, after a number of crashes in which DU weights burned in the fire and contaminated populated areas. Some helicopters have DU weights in the rotor blades, for example, Apache A64 has 100 kg. DU weights would be logical in guided missiles and in other weapons that employ, like aircraft, flight control surfaces. Small quantities of uranium may be in navigational equipment in aircraft, vessels and land vehicles.

During the "Kosovo DU" scandal, U-236, plutonium, americum and other transuranic elements turned out to be in DU, contrary to industry specifications. Although these extremely toxic and radioactive substances were present only in trace quantities, their high power significantly increases the toxicity and radioactivity of the 30 mm DU bullets shot in Operation Allied Force. The substances are spent nuclear fuels and nuclear waste recycled into DU stock. Uranium alloy in weapons has a composition and toxic-radioactive properties depending on what other materials in what quantities have been blended in.

It is, of course, convenient to dispose of very hazardous nuclear waste far away from the producer's country. Much testing of DU weaponry took place outside the national territory of the United States: Okinawa, Puerto Rico (Vieques), Panama (whose government found out about it after the fact) and on lands legally considered to be the lands of Indigenous Peoples in the United States. According to Williams's compilation of industry and military sources, other radiological weapons were most likely tested in Iraq (Operation Desert Storm 1991, Desert Fox 1998), in air raids in Iraq's no-fly zone since 1992) and the Balkans (Bosnia 1994-1995, Kosovo 1999). Most recently in Afghanistan, the use of these weapons was confirmed by high contamination of residents near sites hit by hard-target weapons. Use outside a states' territory brings in a whole body of international prohibitions related to "exporting" hazardous materials. As will be set out in Part II, responsible authorities are liable under a wide range of international law beyond humanitarian law.