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Depleted Uranium Ammunition

Anatomy of a Super Weapon

Benjamin Paassen

International Physicians for the Prevention of Nuclear War

April 13th 2012



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Atoms

- atom: consists of neutrons (0), protons (+) and electrons(-)
- number of protons/electrons define the element
- neutrons: "glue" of the nucleus

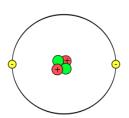


Figure: helium atom ¹

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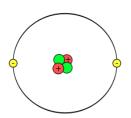


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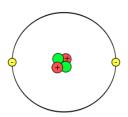


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Isotopes

- isotope: atom of the same element with different number of neutrons
- isotopes of natural uranium:
 - about 99,3 % U238 (stable) (92 protons + 146 neutrons
 - about 0,7 % U235 (rather unstable) (92 protons + 143 neutrons)

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Uranium Enrichment

enrichment: increasing U235 fraction

nuclear power plant fuel: 3-5 % U235

■ nuclear weapon fuel: up to 95 % U235

by-product: depleted uranium (about 0,3 % U235)

average German nuclear power plant : about 107 t U depleted uranium per year



²http://www.wise-uranium.org/nfcm.html

³Red Book 2007

⁴Wikipedia / common domain

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Figure: nuclear fuel pellets 4

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Radiation and Toxicity

- half-life: about 4,5 billion years (10⁹)
- α -radiation-emitter
- lacksquare heavy metal o high chemical toxicity

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α -radiation

- \blacksquare three types of radiation: α , β , γ
- alpha: highest energy (particle radiation), but lowest range (about 10 cm), can not penetrate even thin surfaces
- → radiation detection very difficult without special equipment (e.g. mass spectrometry)

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Density

- density of (depleted) uranium: $19, 1\frac{g}{cm^3}$ (lead has $11, 34\frac{g}{cm^3}$)
- ightarrow a cube (10 cm edge length) of uranium would weigh 19 kg
- ightarrow very high mass for little volume and little surface



Figure: block of uranium ⁵

⁵Wikipedia / common domain

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Military Benefits

- very high penetration power
- DU weapons are used to destroy bunkers and tanks
- mostly tank grenades or ammunition for airplanes 6



Figure: M1 Abrams Tank ⁷

⁶http://www.bandepleteduranium.org/en/i/95.html

⁷Wikipedia / common domain

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Technical Details

- projectile consists of hull and DU core (penetrator)
- e.g. 120 mm tank grenade



Figure: DU penetrator for 20 mm bullet ⁸

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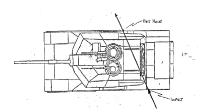
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Firing a DU Projectile

projectile penetrates hull

- ightarrow high friction energy
- \rightarrow temperatures of up to 5000 $^{\circ}$ C
- ightarrow projectile hull melts of and part of the DU core vaporises
- \rightarrow DU dust (UO_2) gets into the environment



⁹Wikipedia / common domain

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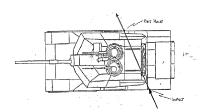
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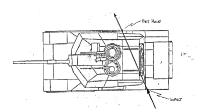
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Defenses

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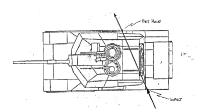
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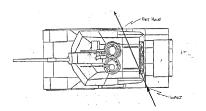
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⁹Wikipedia / common domain

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Suppliers

- mainly NPT-states with nuclear weapons: USA, UK, France, Former Soviet Union States, China
- not-NPT-state: Pakistan
- mostly western arms manufacturers ¹⁰



Figure: map of nuclear weapon states in the world ¹¹

¹⁰http://www.bandepleteduranium.org/en/i/20.html

¹¹Wikipedia / common domain

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Users

- main users: USA, UK, France, Russia, China (same as producers)
- at least 18 states total ¹²
- $lue{}$ uranium ammunition hardly detectable ightarrow possible proliferation through black market channels

¹²http://www.bandepleteduranium.org/em/i/@i/httml ⋅ ৄ → ৄ ∽ ००

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- uranium dust: nano particles (about $10^{-9}m$)
- ingestion through drinking water, food, breathing air or even skin
- DU is incorporated and concentrated in several parts of the body
- radiation <u>and</u> chemotoxicity
- negative health effects are often synergistic
- ightarrow damage in detail documented in 69 studies (mostly done with animals) listed by ICBUW 13

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¹³This chapter is based on Dr. W. Eisenberg (IPPNW) summary of these studies (2011)

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- health consequences might include (examples):
 - ightarrow cancer
 - ightarrow psychic/neurological damage
 - → leukemia
 - → chronic kidney disease
 - → lung fibrosis
 - → autoimmunity
- different possible interactions with drugs

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- DU breaks mother-child-barrier and does harm to unborn children
- can cause damage to genetic material (e.g. double chromosome breaks)
 - ightarrow even children born much later might be deformed
- genetic damage may be inherited over generations
- much higher infant mortality in contaminated areas

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- ongoing debate in medicine: Are the syndromes caused by DU?
- symptoms of DU contamination and syndromes are very similar
- discussions about Quirra Syndrome (military training ground in Italy with DU ammunition)
- ightarrow connection between DU and syndromes seems very likely

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- Gulf Wars / Iraq Wars (1991, 2003)
- Libya (2011)?
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- unknown locations?

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Iraq Wars

in both cases: US troops attack Iraq using DU ammunition

■ 1991: about 340t

■ 2003: about 1000-2000 t

■ largest known amount of DU ammunition used ever

high contamination in and around Basra ¹⁵

soldiers come home with Gulf-War Syndrome

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- in both cases: NATO troops try to intervene in an existing conflict and use DU ammunition (mainly US troops)
 - Bosnia (1994): about 4000 rounds of DU ammunition (about 1,3t)
 - Kosovo (1999): about 20000 rounds of DU ammunition (over 5t)¹⁷
- 2010: Norway funds an ICBUW research trip \rightarrow still radiation hotspots



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Marking Contaminated Territory



Figure: known areas contaminated with DU in Kosovo ¹⁸

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Relocating Affected Population

- relocation of population from contaminated areas extremely expensive
 - e.g. Basra: 3.5 million residents
- \blacksquare civil health structures destroyed in war \rightarrow health
- \blacksquare erosion (wind etc.) spreads contamination \rightarrow probably



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- $lue{}$ civil health structures destroyed in war ightarrow health monitoring difficult
- erosion (wind etc.) spreads contamination → probably further relocation needed
 - e.g. hotspots in Arbil (Northern Iraq / Kurdistan, over 800.000 residents): winds have spread contamination from the south 19



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Decontamination

- decontamination hardly possible at all
- high financial costs & high amount of manpower needed ²⁰
- contaminated material (earth, ammunition) has to be contained even after clean-up
- hotspots remain

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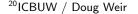
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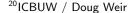
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Pros and Cons

Pro

- + military benefits
- cost effective

Contra

- hits enemies and civil population indifferently
- health hazards for civil population and own soldiers
- transgenerational effects
- irreversible contamination

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Possible Campaign Targets

- force DU users to clean up their mess
- individual laws for each country (already passed in Costa Rica and in legislation process in Ireland and New Zealand²¹)
- lacktriangle international convention to ban all uranium weapons (o ICBUW)

²¹ Doug Weir / IPPNW Chernobyl Congress 2011 ₽ + ← E + ← E + → P

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Reasons for a Ban

different treaties ban weapons already:

- Chemical & Biological Weapons Convention
- anti-personnel mine convention (Ottawa Treaty)
- 9 NATO-states agree with a ban (e.g. Germany)
- existing treaties already forbid weapons that kill indifferently (International Humanitarian Law)
- WHO: There is no harmless dosage of radiation ²²

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