

# DEPLETED URANIUM

— the truth and nothing but the truth

by Mike Sheheane

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*Silver bullet! The unstoppable force! The immovable object! The best armor-piercing munition available! The best armor protection available! All these statements have been used to describe depleted uranium or DU. Negative statements also have been made about DU and the hazards associated with it. The following paragraphs relate what I believe every soldier should know about DU. Keep in mind, I write from a training developer's perspective and not as a scientist, so readers who are sticklers for detailed data may be disappointed. Hopefully, those of you who just want the facts will get some satisfaction from what is presented here.*

## Background

During Operation Desert Storm U.S. military forces used DU munitions and armor in combat for the first time. The effectiveness of both the munitions and the armor were unmatched by anything available to allies or opposing forces. Figures available indicate that thousands of Iraqi tanks and other vehicles were damaged or totally destroyed by DU munitions fired from U.S. tanks, fighting vehicles, and aircraft. Not a single U.S. tank and only a half dozen fighting vehicles were lost to Iraqi fire.

After the war, a government-sponsored report stated that most U.S. soldiers were not fully aware of the potential hazard associated with DU residue found on the battlefield. To rectify this deficiency, the U.S. Army Chemical School was tasked to assume the lead in developing a training program. This effort, done in coordination with the U.S. Army Ordnance Center and School, was completed in 1996, and training was implemented early in 1997. During and subsequent to the development of the DU training materials, several medical and scientific studies were conducted to analyze the effects of DU on the health of personnel wounded by or exposed to the effects of DU. After analyzing the results of these reports and studies, the 1998

Medical/Chemical Review Conference recommended that a joint effort be initiated to revise the DU training materials to more accurately reflect health and safety hazards.

## What Soldiers Should Know

Soldiers in the field need to understand two important points that justify the use of DU:

- DU is the best armor-piercing material available for use in a variety of kinetic energy anti-armor munitions. This is because DU is a very dense material (one and a half times the density of lead), and it “self sharpens” as it penetrates. This self-sharpening characteristic makes DU better than tungsten, which mushrooms as it penetrates. Additionally, DU is pyrophoric, which means that as the penetrator self-sharpens, the small particles that flake off can ignite spontaneously in the air. The sparks produced often ignite fuel or munitions contained inside the target, giving DU rounds the capability to cause explosions without being an explosive.

- DU provides the best armor protection available. This is because of the density of the material. Plates of DU are sandwiched between outer and inner steel plates on “heavy armor” versions of the M1A1/A2 Abrams tank and provide

greater protection than solid steel, alloys, or laminates, and they can defeat most currently fielded, non-DU antitank munitions.

Several weapons systems use DU. The most common DU round fired by the Army is the 120mm M829-series round for the main gun of the Abrams tank. For those who appreciate minutia, the official terminology is Armor-Piercing Fin Stabilized Discarding Sabot (APFSDS), but most people call it the “sabot round” (Figure 1). The dart-like penetrator rod is fitted with an oversized non-metallic collar that ensures a proper fit in the gun barrel. The collar falls away as the round leaves the barrel, which allows the penetrator to travel at an extremely high velocity and retain considerable downrange energy. Older versions of the Abrams tank fire a 105mm DU round. The M2/M3 Bradley fires a 25mm round in the Bushmaster cannon.

Other services also use DU rounds. The Air Force A-10 Thunderbolt uses a 30mm DU round in its main gun while the Marine AV-8 Harrier fires a 25mm round. The Navy uses DU in a 20mm round fired by the Phalanx gun system.

Tests and combat action have demonstrated the value of DU as an effective enhancement to the armor of the M1-series tank (Figure 2). DU plates inserted



Figure 1. The M829-series 120mm rounds come in a variety of forms. All can be fired from the M1A2 tank.

between regular steel armor on the front of the turret can defeat most known non-DU armor-piercing munitions.

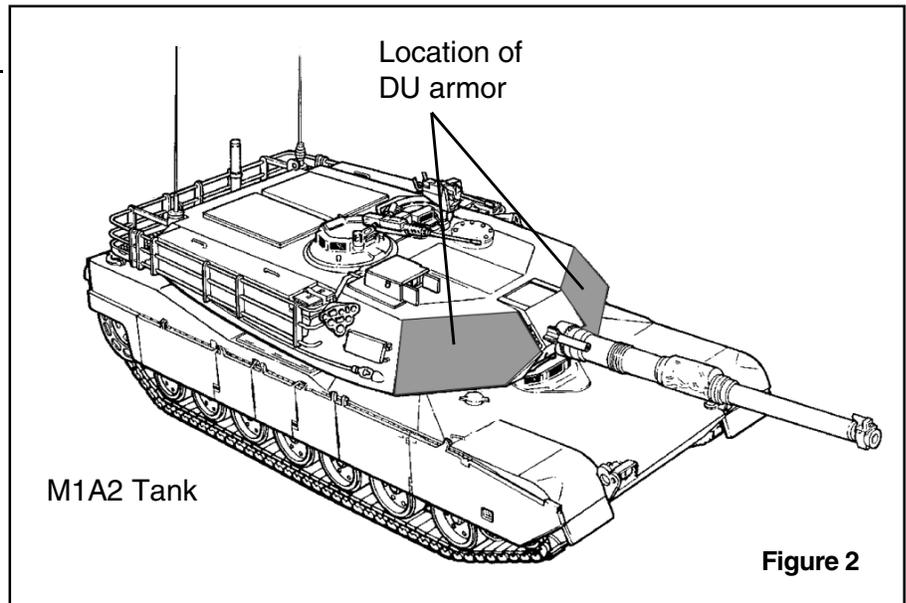
### The Problem

Since DU is the best weapon and the best armor, what's the problem? DU is a slightly radioactive heavy metal. It is 40 percent less radioactive than natural uranium. DU is primarily an alpha emitter, but it also emits small amounts of beta, gamma, and X-rays. The heavy metal aspect makes it chemically toxic, like lead. Ingesting a large amount of DU residue into the body by either breathing it into the lungs or swallowing it into the digestive tract is a primary hazard. Tests show that the only time this is likely to occur is when a soldier is: (1) in or near an armored target that is struck by a DU round; (2) in or near a heavy armored tank that is breached by any kind of round; (3) near a fire involving DU munitions; or (4) frequently entering vehicles that have been hit by DU rounds or have DU armor that was breached.

Soldiers who handle bare DU penetrators found on the battlefield also are exposed to significant amounts of DU. (Of course, every soldier knows it is inappropriate to handle any type of battlefield debris unless directed to do so.) I do not discuss embedded fragments because medical personnel treat these injuries in much the same manner as wounds from any type of shrapnel. Studies of soldiers wounded by DU fragments have failed to identify any adverse health effects specifically related to the radiological or chemical characteristics of DU.

In its "packaged" or unfired form, DU ammunition presents very little hazard. Soldiers may hold an unfired 120mm round for 940 hours without exceeding the total body exposure limit of 5 rem per year. Once fired, DU presents a greater hazard, but one would have to hold a DU penetrator in his bare hands for more than 250 hours before exceeding the exposure limit for skin or extremities of 50 rem per year.

For DU to be a hazard to personal health, the body must contain enough DU to cause radiological damage to the lungs or digestive tract or to cause toxic chemical damage to the kidneys. Protective measures should be taken to prevent exposure. There is not much a soldier can do to prevent some exposure if his vehicle is hit by a DU round or his heavy armor tank is breached. Just realizing he is still alive probably will be the most important thing at the time. But, soldiers near a DU round strike or armor breach can take protective measures.



### Protective Measures

Inhaling or ingesting DU in amounts experienced in battle does not pose an immediate health risk and must not prevent a soldier from saving his buddy's life or from continuing the fight. Wearing an M40 protective mask is the easiest and most effective way to prevent inhalation of DU dust and residue suspended in the air or in smoke from a DU munitions fire. Other types of respiratory protection are being evaluated for maintenance personnel who must work for extended periods inside damaged armored vehicles. To keep from ingesting DU residue, soldiers must keep it out of their mouths. Cover all exposed skin and wear gloves to keep the DU off and wash hands and face after being around DU to keep it from getting into your mouth and digestive tract.

If soldiers must remain in an area where DU is present, wear a protective mask and cover all exposed skin. Soldiers in a confined space, such as the crew compartment of a tank, should decontaminate the area to remove as much DU dust and residue as possible. The new *FM 3-5, NBC Decontamination* (to be published in second quarter of FY00), addresses DU decontamination. As with other decon efforts, the intent is to remove as much of the hazard as possible. This is best accomplished by vacuuming the vehicle with a high-efficiency particulate air (HEPA) filter-equipped vacuum cleaner. Since few organizations have this vacuum, *FM 3-5* describes a wet wipe-down procedure. The residue from that decon procedure will contain DU, and it should be treated like any other hazardous waste: bagged and tagged and handled in accordance with the unit SOP.

Numerous medical tests have been conducted and are being conducted to assess

the potential health effects of DU on veterans who were exposed during the Gulf War. To review this data, go to web site (<http://www.gulflink.osd.mil/library/randrep/ducover.html>) and access "A Review of the Scientific Literature As it Pertains to Gulf War Illness: Volume 7, Depleted Uranium" (RAND Report).

An extensive effort has been completed recently to provide updated, accurate data to all soldiers concerning the potential hazards of DU and protective measures that should be taken by those exposed to DU dust and residue. Data show that DU is only a hazard in very specific instances and should not prevent actions to save lives or to continue the mission. All soldiers will receive Tier I — DU General Awareness Training — either during attendance at a resident school or as common task training in their unit. This block of instruction is approximately one hour long and includes a 15-minute video. The new *Graphic Training Aid (GTA) 3-4-1A, Depleted Uranium Awareness*, supports the general awareness training and common task testing. These training materials emphasize a few basic points:

- No additional protective measures are required for unfired DU munitions or intact armor.
- Never allow the presence of DU to interfere with efforts to save lives or treat the wounded.
- Never allow the presence of DU to interfere with the conduct of combat operations.
- Do not handle DU or other battlefield debris unless directed to do so.

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- Wear respiratory protection (mask), cover exposed skin, and wear gloves, if you must handle or work around DU dust or residue.

Maintenance personnel assigned to battle-damage assessment and repair teams receive an additional block of instruction. Tier II — Battle-Damage Assessment and Repair provides soldiers who routinely work inside the crew compartment of armored vehicles with the knowledge they need to take appropriate protective measures when required. The Ordnance Center and School is developing a “DU Kit” that contains a disposable HEPA filter mask for nose and mouth, disposable gloves, wet wipes for decontaminating interior surfaces, and plastics bags to collect and dispose of these items after use.

Chemical soldiers receive training beyond the general awareness level. Tier III — NBC Advisor, provides the most detailed technical information of the three tiers. Every effort has been made to ensure chemical NCOs and officers know how to properly advise their unit commanders and staffs on the impact of DU on unit operations.

Depleted uranium is the best ammunition to defeat enemy armor, the best armor to protect U.S. soldiers, and does not present a health hazard when appropriate protective measures are taken. The information provided above sheds some light on the subject of depleted uranium. The controversy surrounding the use of DU probably will not disappear any time in the near future and research will continue. Based on current information, DU does not pose a militarily significant threat to soldiers who take basic measures to avoid unnecessary contact and exposure.

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At the time this article was written, Mike Sheheane was serving as the Chief, Chemical Warrior Division, Warrior Department, DOTD, MAN-SCEN. He is a career civil servant and a retired U.S. Army Reserve officer. Sheheane is a graduate of the Army Command and General Staff College, and the Senior Training Manager’s Course. He holds a master’s degree in both Education and Criminal Justice.