

General (Ref-TA15)

RADIOACTIVE BATTLEFIELDS OF THE 1990s
THE UNITED STATES ARMY'S USE OF DEPLETED URANIUM
AND ITS CONSEQUENCES FOR HUMAN HEALTH AND
THE ENVIRONMENT

TECH DOCS



American M1-A1 tank in front of burning T-72s (Iraqi tanks), outside Basra, Iraq, March 1, 1991. M1-A1 tanks are clad with depleted uranium (DU) and fire penetrators made of DU. "Since DU weapons are openly available on the world arms market, DU weapons will be used in future conflicts. The number of DU patients on future battlefields probably will be higher because other countries will use systems containing DU."—from the Army's unreleased report on depleted uranium weaponry

**A RESPONSE TO THE ARMY'S UNRELEASED REPORT ON
DEPLETED URANIUM WEAPONRY**

**BY THE MILITARY TOXICS PROJECT'S
DEPLETED URANIUM CITIZENS' NETWORK**

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KILLING OUR OWN—AGAIN

In the 1940s and 1950s, hundreds of thousands of American soldiers were knowingly exposed to the radioactive fallout of nuclear testing; in the 1960s and 1970s, thousands more suffered the effects of Agent Orange; in the 1990s, military use of depleted uranium (DU) is contributing to another generation of veterans whose severe illnesses, deaths and children with birth defects were and are an avoidable tragedy. DU munitions and armored vehicles are currently being deployed in Bosnia, in what could become yet another international human health and environmental catastrophe, and DU ammunition has already been used in that conflict. The recent Army report on DU sanctions both its use and its proliferation, despite the consequences.¹

Five years ago, DU was used in warfare for the first time as both armor-piercing bullets and as tank armor, by the U.S. Army in Operation Desert Storm. More than 350 tons of DU fragments and particles still lie on the battlefields of the Gulf War, and depleted uranium has been documented in the bodies of some Gulf War veterans and may be present in many more. Uranium, depleted or not, is a deadly substance, and DU has been indicated as a likely factor in what has been nicknamed Gulf War Syndrome, the cluster of illnesses and birth defects affecting those veterans and their families.²

Immediately after its fiery end in March 1991, the Gulf War was hailed as a virtually bloodless victory for the U.S.; now it seems that it may take decades or generations before the actual U.S. casualty count will begin to appear—as it did with the atomic veterans (those soldiers exposed to nuclear testing and radiation by the military). Meanwhile in Iraq, states the *Washington Report on Middle East Affairs*, "health officials have reported alarmingly high increases in rare and unknown diseases, primarily in children. Anencephaly, leukemia, carcinoma and cancers of the lung and digestive system have risen dramatically, as have late-term miscarriages and incidence of congenital disease and deformities in fetuses," which Dr. Siegwart Horst Guenther of Austria's Yellow Cross attributes to uranium contamination. Kuwait has not yet come to terms with the scope of the

cleanup that will be required.³

DU is nuclear waste, and the U.S.'s testing and wartime use has spread this deadly material across the U.S., Kuwait, and Iraq. Without concerted international action, it will continue to be used in worldwide conflicts; and DU arms proliferation—fostered largely by U.S. arms sales—will continue to spread DU across the world (the Army itself admits that "the United Kingdom, Russia, Turkey, Saudi Arabia, Pakistan, Thailand, Israel, France, and others are developing or already have DU-containing weapons systems"; and virtually every nation with nuclear energy or weapons programs has access to the material). The health and human consequences and environmental effects of continued DU use are a disaster in the making; and the costs of cleanup, compensation, and medical care could be astronomical. DU is an avoidable and unnecessary disaster, one that can be stopped now.⁴

Stopping DU proliferation starts with recognition of its dangers. The recent technical report *Health and Environmental Consequences of Depleted Uranium Use in the U.S. Army* by the Army Environmental Policy Institute (AEPI) meant to address this issue, but it is a self-contradictory tangle of optimism, omission and occasional bald admissions. Despite these admissions, it fails to call for adequate measures for controlling and curbing the use of this deadly substance. *Radioactive Battlefields of the 1990s* is a response to that report.

BACKGROUND

Naturally existing uranium refined from ore is made up largely of U-238, a relatively stable isotope of the element, from which the highly fissionable isotope U-235 is extracted for nuclear weapons and power uses. After the U-235 is partially extracted (reduced from approximately .7% to .2% of the natural uranium), the remainder is misleadingly called depleted uranium. It still can be used for nuclear weapons and energy programs by being transformed into plutonium in a breeder reactor, and it is still radioactive and toxic. Recent studies indicate there is no threshold level of radiation below which an exposed person is safe from radiation damage, and though DU is less

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radioactive than U-235 or plutonium, it remains an extremely harmful substance with the chemically toxic properties of many heavy metals. Huge quantities of DU have accumulated in the course of U.S. energy and weapons programs—the Department of Energy alone holds a billion pounds of DU hexafluoride tails. Usually classed as low-level nuclear waste and viewed as a liability, DU has in recent decades been tried out for civilian and military uses.³

Because of uranium's extreme density, DU can be used to make munitions and armor of great density. The penetrators made with DU have great range and velocity, velocity that gives them an ability to penetrate most kinds of armor (including otherwise virtually impenetrable DU armor, as Gulf War friendly fire casualties demonstrated). But their battlefield effectiveness is undermined by DU's deadly qualities, qualities that cannot be contained.

DU is a highly toxic and radioactive heavy metal with pyrophoric (flammable) properties: it bursts into flames upon impact. The burning uranium then spreads into the atmosphere, creating a small-scale fallout of aerosolized uranium particles which can be inhaled or ingested from the air or by contact with contaminated materials and sites. These particles can travel anywhere that dust goes. Most readers are familiar with the postwar images of blackened, burnt-out Iraqi vehicles: many of these were DU targets (as were the 6 U.S. Abrams tanks and 15 U.S. Bradley Fighting Vehicles hit by friendly fire). A survey shows that four out of five U.S. soldiers entered destroyed Iraqi vehicles, many of them DU-contaminated, but no studies have yet accounted for the degree of exposure or its possible long-term effects.⁴

In April of 1995, French General Gallois remarked, "If we equip these tanks with these sorts of munitions, that means that chemical-nuclear war is morally allowable." Radioactive and chemical weapons are internationally regarded as unacceptable, because their effects cannot be directed or

contained and because they cause slow, cruel suffering and death; civilians, descendants, passersby, and allies are all likely to be victims. Although DU is used in conventional weapons systems and classified as a conventional weapon, its pervasive radioactive and chemical effects suggest this classification is inadequate and inaccurate.⁷

DEPLETED URANIUM AND NUCLEAR HISTORY

Since the beginning of the Manhattan Project in 1942, the United States Army and the Department of Energy have been creating problems for which there are no solutions—beginning with the creation of vast quantities of radioactive material for which no adequately safe disposal methods or sites exist; and with weapons systems whose contamination spreads far beyond the intended target. The public history of nuclear weapons and energy is also the private histories of hundreds of thousands of citizens, from the quarter-million troops intentionally exposed to atomic testing between 1946-1963 and the civilians downwind of these tests, to the many citizens exposed to harmful amounts of radiation at all stages of the nuclear cycle, from mining and manufacture to deployment and disposal. High percentages of all these populations have experienced the illnesses, cancers and genetic defects that result from radiation exposure. DU weaponry is the latest, unfinished chapter in this long history of governmental recklessness and personal tragedy. Like radiation and many other toxins, DU disproportionately affects the poor and communities of



Tank contaminated by its own DU penetrators and consigned to the Nevada Test Site as nuclear waste. Photo: © James Leavitt. All rights reserved.

color at home and in war. Nearly 50% of those on the front lines of the Gulf War were people of color, and DU assembly and testing facilities are mostly located in and near poor communities and communities of color.⁹

The argument that the U.S. should have DU weaponry if others do is a dubious one, because the effects of radioactive and chemical weapons cannot be directed and contained—for example, U.S. veterans of the Gulf War are suffering from their own army's use of DU. Its international proliferation ends the U.S.'s brief advantage as the primary user of DU armaments and armor and suggests that the battlefields of the future may be more horrible than anything yet seen. To go

Anthony Guarisco (center), founder and director, Atomic Veterans Alliance, leading an anti-nuclear action at the Nevada Test Site, Veterans Day 1991. Guarisco was 19 when he was exposed to radiation from the U.S.'s Crossroads nuclear explosions in 1946. He became sick four days afterwards and has since been plagued by radiogenic illnesses, including chromosome damage passed on to his children in the form of birth defects. He says, "What's happening to Gulf War veterans is exactly what happened to atomic and Agent Orange vets—all of these vets found that the government turned its back on them." Photo: Dana Schuerholz.



into future battles in which DU is used may mean, for the immediate survivors, an indeterminate life sentence waiting for uranium's dire chemical and radioactive effects to appear. The DU battlefields themselves could be something new: international sacrifice areas too contaminated ever to be put to peaceful use.

THE DU REPORT BY THE AEPJ

The AEPJ's technical report on DU expands on a June 1994 report commissioned by Congress to determine these four things: "the health and environmental consequences of using DU on the battlefield; remediation technologies to clean up DU contamination; ways to reduce DU toxicity; how best to protect the environment from the long-term consequences of DU use." The more than 200-page-long technical report has not been

released to the public, few members of Congress have seen it, and even the Presidential Advisory Committee on Gulf War Veterans' Illnesses has been unable to obtain a copy. It is, however, the document on which many decisions about DU use may be based. For this reason, public and expert appraisal of the report is critical.⁹

The Military Toxics Project's Depleted Uranium Citizens' Network, which was able to obtain a copy of the report, finds it to be severely flawed, because its conclusions are inconsistent with its credible scientific statements. Perhaps the most basic and crucial statements are these: "No available technology can significantly change the inherent chemical and radiological toxicity of DU. These are intrinsic properties of uranium" [from p. xxii], which answers the third point of the congressional inquiry; and "DU is a low-level radioactive waste and, therefore, must be disposed in a licensed repository" [from p. 154] which addresses the first, second, and fourth points. From these admissions alone, it is

clear that DU is a deadly substance from which soldiers, the public and the environment must be protected beforehand, because no technology can afterwards adequately mitigate its effects; and that spreading it across test sites and battlefields conflicts with the disposal recommendation. Yet the report goes on, through many twists and turns of logic and optimistic assertions on military practices, to endorse the continued use of DU by the U.S. military. Finally it somewhat undermines this endorsement with calls for further research and implementation of better safety procedures.

There is no safe way to use DU, and a very basic question is why something considered to be hazardous radioactive and chemical waste in all other circumstances is considered safe in battlefield conditions. As the AEPJ admits on page 78, "As much as 70 percent of a DU penetrator can be

aerosolized when it strikes a tank (Fliszar et al., 1989). Aerosols containing DU oxides may contaminate the area downwind. DU fragments may also contaminate the soil around the struck vehicle." DU munitions aerosolize when used, DU tank armor can aerosolize when struck, and there are many paths by which the resulting particles may enter the body—by inhalation, ingestion, or through open wounds. On page 101, the AEPI also concedes, "If DU enters the body, it has the potential to generate significant medical consequences. The risks associated with DU in the body are both chemical and radiological...." Once inside the human body, uranium particles tend to stay, causing illnesses such as lung cancer and kidney disease that

often take decades to manifest. According to pioneering radiation biomedical researcher Dr. J. W. Gofman, particles of uranium smaller than 5 micron in diameter can become permanently trapped in the lungs. Leonard A. Dietz, former Knolls Atomic Power Laboratory scientist has estimated that a trapped,

single uranium oxide particle of this size can expose the surrounding lung tissue to approximately 1,360 rem per year. This is 8,000 times the annual radiation dosage permitted by federal regulations for whole body exposure to the general public. Particles not trapped in the respiratory system may be ingested and find their way into the kidneys and reproductive organs.¹⁰

One thing the report does make clear is that the DU exposure of most Gulf War veterans has not been taken seriously, documented, or studied, although the Army's own admissions suggests hundreds of thousands of soldiers and citizens may be at risk from having internalized DU. Only the small minority with actual DU shrapnel in their bodies is currently being studied for DU effects (DU bullets killed 35 U.S. soldiers and wounded 72—22 of whom have embedded

DU fragments). However, DU is equally toxic and radioactive when it enters the body by other avenues, such as inhalation and ingestion. Potential risks for medical personnel treating contaminated soldiers, for cleanup crews and for civilian populations who come or return to the DU battlefield regions are completely overlooked, as are risks at other points in the weapons production, use, and disposal cycle. In 1980, workers at a Jonesboro, Tennessee plant, which manufactures DU penetrators, had the highest radiation exposures of any nuclear workers in the nation. One DU manufacturer, National Lead Industries of New York, was forced to shut down in 1980 because their emissions exceeded 150 micro-curies



Charles Sheehan Miles, Gulf War veteran and DU Network member, inside his tank. "I helped pull a crew away from a burning tank, hit by a DU penetrator. I got out of the army as a conscientious objector because of the civilian casualties I had seen. About two years after the war I got a melanoma on my back and it scared me into doing some research. If it hadn't been for the melanoma I would have never found out what I know now about depleted uranium."

(385 grams) in a given month. Leonard Dietz, in a letter to *The Bulletin of the Atomic Scientists*, asked "If New York State authorities were concerned about the release each month of radiation equivalent to the particles from one or two uranium projectiles, why isn't the U.S. government concerned about the effects of tens of thousands of projectiles being fired in a few days of war?" Citizens Research and Environmental Watch (CREW), a Concord, Massachusetts grassroots organization concerned about local DU munitions manufacturer Nuclear Metals, Inc., had soil samples from six Concord locations analyzed. The tests found uranium levels up to 18 times background levels and as far as nine-tenths of a mile away from the plant. It is urgent that assessment and appropriate medical treatment begin for everyone exposed by any of these avenues.¹¹

Despite such omissions, the AEPI report is most useful as a document of some of the existing dangers and poor practices. Among them are:

army shortcomings and admissions

—The admission "The Army did not pursue many of the health-related studies and most of the environment-related studies recommended in these reports" appears on page 3, following a list of four Army-commissioned reports. Throughout the AEPI technical report, similar admissions document the many other health and ecological effects of DU the Army has failed to investigate. And on page 94, the accuracy of the existing research is called into question: "Researchers conduct experimental procedures and data analyses without external peer review to validate the quality or completeness of their work. Thus the Army does not appear to closely coordinate the planning and performance of experiments for DU health and environmental assessments."

The authors of the DU report themselves sometimes indulge in baseless assertions and sometimes acknowledge they do so, as in this astounding statement from page 4: "The potential for health effects from exposure to DU is real; however it must be viewed in perspective. It is unlikely that any of the DU exposure scenarios described in this report will significantly affect the health of most personnel. In several areas, neither the scientific community nor the army have adequate medical or exposure information to defend this assertion."

DU in the Gulf and in soldiers

—Although the Army has developed safety procedures and publications for dealing with DU, these were seldom, if ever, put into practice in the Gulf War. The AEPI report, on page 81, concedes that the 144th Army National Guard Service and Supply Company was allowed to proceed with battlefield cleanup for three weeks before these materials were introduced. Pages 81-85 document the overall lack of precautions. Gulf War soldiers and field commanders declare that they were never warned that DU is radioactive—in fact, General Calvin Waller told NBC's "Dateline" that neither he nor General Norman Schwarzkopf were ever told about the health hazards of DU. Early information suggests that troops deployed in Bosnia

with DU-armored tanks and personnel carriers and DU rounds are also unaware they are at risk from DU exposure, and the Bosnian government has not been advised of the risk.¹²

—Page 89. "A large number of DU rounds used in Operation Desert Shield/Desert Storm were destroyed during a fire at an ammunition depot." The depot is actually the Doha base used by the U.S. Army in Kuwait; no information is provided on whether any measures were taken to minimize exposure, what the exposure may have been, how many rounds were burned, and other crucial aspects of this underemphasized disaster. Independent information suggests no significant cleanup was made a year later. Nor has the overwhelming task of cleaning up the Gulf War battlefields been addressed by this report, except to point out the U.S. is not legally obliged to do so, on page 83, and in a comment a page later, "It does not appear that Kuwait has addressed the long-term management of hazardous and radioactive materials in captured vehicles."¹³

DU and the U.S. environment

—Similarly, an offhand reference on page 65 to "investigating propellant disposal methods that are less likely to inject DU into the environment than open burning/detonation or incineration processes currently used for waste propellant destruction" suggests that the disposal of DU contaminated propellant by burning is a recklessly dangerous method that may spread DU particles into civilian communities and the environment.

—On page 26, comes this information: "More than fifty current and former sites have been involved in the production, manufacture, development, testing and storage of DU for various DoD [Department of Defense] uses." Cleanup of domestic DU test sites—which include Jefferson Proving Ground in Indiana, Yuma Proving Ground in Arizona, and Aberdeen Proving Ground in Maryland—has not yet begun and would require extensive measures: page 67 "The Army has never decontaminated or decommissioned soft-target impact areas at its test centers."; and page 72 "First, NRC [Nuclear Regulatory Commission] allows the Army to bury low concentrations of DU with no restrictions on burial method."; and page 73, "Alternatively, NRC

allows the Army to dispose of low concentrations of DU by burying them under prescribed conditions so that no subsequent land use restrictions and no continuing NRC licensing of the material are required."

Thousands of acres of U.S. bases that house these firing ranges are contaminated, and in the executive summary comes this admission (p. A-9): "At Aberdeen, localized soil contamination was discovered at depths of 20 centimeters (7.9 inches) below a penetrator corroding on the soil surface. This suggested that DU can become soluble and migrate...."

The report makes it clear that real cleanup will be enormously expensive, requiring disposal of vast quantities of contaminated soil, in some cases it may be impossible, and it has not yet begun. The recommendation cited above, that DU be recognized as radioactive waste and appropriately disposed of, conflicts with all these practices. The few low-level waste dumps in the U.S. are already overwhelmed, and adding to the material waiting for disposal seems, to say the least, unwise.

DU as a disastrous future

—The consequences of DU production are accepted by the AEPI: On page 120, the report declares, "Since DU weapons are openly available on the world arms market, DU weapons will be used in future conflicts." No mention is made of the fact that the U.S. dominates this market. Later on page 120, "The number of DU patients on future battlefields probably will be higher because other countries will use systems containing DU."

conclusions

The AEPI report is intended to endorse the Army's past use and future plans to use DU. Yet the report documents the enormous problems that currently exist and the intractably radioactive, toxic nature of DU. Given this documentation, it is clear the Army can only go forward with DU weaponry development and deployment by considering contamination of the environment, civilians and its own soldiers as an acceptable cost. Intentionally or not, it underscores the need for a worldwide ban on DU, cleanup of existing sites, better interim safety practices, and better medical attention and research for those who have been exposed.

RECOMMENDATIONS

The Depleted Uranium Citizens' Network of the Military Toxics Project makes the following recommendations:

- 1: Pursue an international agreement to ban all weapons containing DU.
- 2: Issue appropriate radiation clothing to soldiers and workers who are exposed to the possible inhalation or ingestion of DU oxide particles during production, testing, training, or wartime exercises until all weapons containing DU are banned.
- 3: Research and develop safe and effective cleanup methods for contaminated sites.
- 4: Request President Clinton join in the call for a Blue Ribbon White House Commission to Review All Radioactive Waste Programs and Policies.
- 5: Conduct independent health studies of Persian Gulf War veterans that determine the toxic and radiological effects of exposure to DU and explain how these effects are distinct from Gulf War Syndrome. Examine the soldiers and civilians who were in locations where they could have been exposed to DU (e.g., soldiers or civilians within a radius of 25 miles of the DU ammunition fire in Doha, Kuwait, should have urinalysis and *in vivo* whole-body gamma counting tests for DU). Furthermore an epidemiological study of veterans who ingested a significant quantity of DU and of their families should be done. This should be done not only for discharged veterans, but for those on active duty as well. Additionally, their children conceived and born after the Gulf War should be examined for evidence of radiation-induced genetic damage. Health studies should also include military and civilian personnel at or near DU manufacturing sites and DU test sites across the United States.
- 6: Establish a peer review committee of leading radiation health experts from the civilian sector that would act as a "Citizens' Watchdog Authority" over the U.S. Army, Department of Veterans Affairs, and the Armed Forces Radiobiology Research Institute on all studies on those who may have been exposed to DU contamination. Such a peer review committee could ensure that appropriate rules of research are applied, that the studies are free from bias, and that they fully account for

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the latency periods of the radiological health effects of DU in the human body. The studies should be conducted over the lifespan of each affected person.

NOTES

1: DU in Bosnia: The 100 M1-A1 tanks sent to Bosnia use DU ammunition. Their presence is confirmed in the December 25, 1995 edition of *Army Times*.

DU has already been used in that conflict. See Associated Press report by David Cray published in the Binghamton, NY, *Press Republican* of August 6, 1994: "Two U.S. A-10s destroyed the [Bosnian Serb] M-78 mobile tank base..."

DU can also be considered in the context of the history of the U.S. military's use of its own troops to test such things as chemical weapons (mustard gas, for example) and psychotropic drugs.

2: Used in warfare for the first time as. It should be noted that DU was used as the casing and casing for early bombs such as Fat Man, the plutonium bomb built by the Manhattan Project and dropped on Nagasaki, and thermonuclear bombs. DU therefore has had a military application for several decades; however its current use as so-called conventional weaponry begins in the Persian Gulf.

More than 350 tons estimates vary from 300 tons (Willits Atkins in *The Bulletin of the Atomic Scientists*, May, 1993) to 800 tons (the LANA Foundation of Amsterdam in H. van der Kerk, "Medium Weight Fast the Backfield Test," *De Groene Amsterdammer*, June 1994). Researcher Dan Fahey of Swords to Plowshares, San Francisco, and the DU Network of the Military Toxicity Project arrived at the 350-ton figure by compiling statistics from the June 1994 AEPJ report on DU weight in individual rounds and numbers of rounds fired.

DU in Gulf War Syndrome: Draw a conclusion drawn from broad sources on the effects of uranium and the information on DU use and battlefield conditions in the Gulf War. See: Grace Bukowski, Damaris A. Lopez, *Uranium Battlefields Home and Abroad: Depleted Uranium Use in the U.S. Department of Defense*, March 1991, published by Center for Altern and Rural Alliance for Military Accountability and *Uranium: Dilemma for The Link between Depleted Uranium, Chemicals and Human Health Risk*, March 1995, published by New Mexico Progressive Alliance for Community Empowerment and National Depleted Uranium Citizens' Network of the Military Toxicity Project. Dr. John W. Guilan's *Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis 1980-1990 and Retention and Human Health* (1993) provide sizeable general information.

3: Health officials have reported. *Kentucky Asbestos Report on Middle East Affairs*, July/August 1995, p. 105. See also Dr. Margaret Heest-Groender in *National Catholic Reporter*, August 25, 1995, p. 3. See also the New York Times of January 21, 1995: "Making the Desert Green: U.S. Uranium Shells Used in the Gulf War May Be Killing Iraqi Children." Kuwait has no use in AEPJ Technical Report, pp. 83 & 89.

4: Nations with DU weapons systems in "A Summary Report to Congress," pp. A1-3 of AEPJ Technical Report.

5: DOE holds a billion pounds of DU hexafluoride tails, in U.S. Nuclear Regulatory Commission, "Disposition of Depleted Uranium Tails from Enrichment Plants," January 25, 1991.

DU has been used for civilian and military uses. See AEPJ Technical Report, p. 25. "Typical non-military systems that use DU include: Newton's direction, components of aircraft ailerons, elevators, landing gear, and (helicopter) rotor blades... counterbalance weights in radar antennae and ballast in satellites..." Although it is the purpose of this report to evaluate military use, these nonmilitary uses present many kinds of hazards and should be questioned.

6: 21 U.S. vehicles hit by friendly fire: see AEPJ report, pp. 78-79 "DU rounds penetrated six crewed Abrams tanks. DU penetrators also hit 15 Bradley Fighting Vehicles. Five other Abrams tanks were contaminated during on-board fires involving their own DU rounds."

Four out of five U.S. soldiers: 82%, according to a survey of 10,053 conducted by Vets Support and the Operation Desert Storm Veterans Association (ODSSA). Veteran Dan Fahey of Swords to Plowshares comments, "Not one of the veterans I have talked to donned a respirator, gloves, or protective clothing before approaching damaged vehicles, or thoroughly washed their hands or face afterwards, as Army guidelines suddenly suggest." Both the AEPJ report and the 1993 General Accounting Office report *Operation Desert Storm: Army Not Adequately Prepared to Deal with Depleted Uranium Contamination* state soldiers had not been educated about DU risks.

7: General Gallois, in *Le Monde Diplomatique*, Paris, April 1994, p. 1.

8: On radioactive waste, see *Worldwatch* Institute, *Worldwatch Paper 106, Nuclear War: The Problem That Won't Go Away*, December 1991.

On nuclear testing, see *International Physicians for the Prevention of Nuclear War, Radioactive Heaven and Earth: The Health and Environmental Effects of Nuclear Weapons Testing as in and about the Earth*, 1991.

On atomic veterans, see Harvey Wasserman and Norman Solomon, *Killing Our Own: The Disaster of America's Experience with Atomic Radiation*, 1982; and James Leuter, *In the Shadow of the Cloud: Photographs and Histories of America's Atomic Veterans*, 1988.

On downwinders, see Howard Ball, *Justice Downwind: America's Atomic Testing Program in the 1950s, 1960s*, and Richard Miller, *Under the Cloud: The Disaster of Nuclear Testing*, 1980.

Like many other issues, DU disproportionately affects. See "Depleted Uranium: Legacy of the Persian Gulf War" in *Health, Poverty and the Environment*, p. 4, Spring/Summer 1995.

9: All quotes in this section come from the AEPJ Technical Report, unless otherwise indicated.

10: See Leonard A. Dietz, Appendix 11, "Fetuses of Baghdad Damaged from a Depleted Uranium Shell Particle," pp. 153-5 of *Uranium: Battlefields and Leonard A. Dietz, letter "Uranium Health Hazard," to Chemical & Engineering News*, Feb. 4, 1991.

11: Workers at Jowakbara, Tennessee: John W. Milby, consultant, International Clearinghouse on the Military and the Environment, Brooklyn, NY, "Depleted Uranium: Radioactive Residue in the Desert," Leonard A. Dietz in *The Bulletin of the Atomic Scientists*, March 1991.

National Lead Industries. See *Schlesinger's Gazette*, Feb. 6, 1980, and Leonard Dietz, letter to *The Bulletin of the Atomic Scientists*, March 1991.

12: 140th Army National Guard: see also General Accounting Office, *Operation Desert Storm: Army Not Adequately Prepared to Deal with Depleted Uranium Contamination*, Jan. 1993, pp. 3-5.

General Walker on NBC's "Dateline," aired on Feb. 22, 1994.

13: Doha bay: Per Dan Fahey's independent interviews with veterans stationed in Kuwait in 1992.

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