GAO

Report to Congressional Requesters

March 2000

GULF WAR ILLNESSES

Understanding of Health Effects From Depleted Uranium Evolving but Safety Training Needed

20000404 005

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

GAO

Accountability * Integrity * Reliability

GAO/NSIAD-00-70

Contents

Letter 3

Appendixes

Appendix I: Scope and Methodology 24

Appendix II: Military Services' Depleted Uranium Safety Training 29

Appendix III: Army's Implementation of Common Task Test—Depleted Uranium Training Requirement 32

Appendix IV: Comments From the Department of Defense 33

Appendix V: Comments From the Department of Veterans Affairs 35

Appendix VI: GAO Contacts and Staff Acknowledgments 36

Tables

Table 1: Number and Percentage of Unit Personnel Completing Army's Required Common Task Test-Depleted Uranium for Fiscal Year 1999 for Selected Army Units 32

Figures

Figure 1: 120-mm Armor Piercing Round With DU Penetrator 6

Abbreviations

DOD	Department of Defense
DU	depleted uranium
VA	Department of Veterans Affairs

DTIC QUALITY INSPECTED 3

GAO
Accountability * Integrity * Reliability

United States General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-284646

March 29, 2000

The Honorable Lane Evans
Ranking Democratic Member
Committee on Veterans Affairs
House of Representatives

The Honorable Russell D. Feingold
United States Senate

The Honorable Bob Filner
House of Representatives

The Persian Gulf War marked the first battlefield use of armor-piercing munitions and reinforced tank armor that incorporated depleted uranium, which improved the ability of U.S. munitions to penetrate the target and of U.S. armor to protect against enemy munitions. Depleted uranium is a low-level radioactive heavy metal, and concerns have surfaced about whether exposure to it could be a cause of the illnesses that many servicemembers have experienced since the Gulf War. Moreover, because the United States used depleted uranium munitions in Kosovo and several other countries have or are developing depleted uranium munitions, concerns exist about potential health effects from its use in current and future engagements.

In view of the controversy about a possible connection between depleted uranium exposure and Gulf War illnesses, you asked us to address the following objectives:

- What is the scientific understanding about health effects from exposure to depleted uranium?
- Are Gulf War veterans experiencing administrative problems with the current medical screening program for depleted uranium health effects?
- To what extent have the services implemented programs to train servicemembers to safely operate in a depleted uranium-contaminated battlefield?

As part of our review, we conducted a telephone survey of Gulf War veterans believed by the Department of Defense (DOD) to have received the highest depleted uranium exposures, and who had been notified by the Office of the Special Assistant for Gulf War Illnesses about participating in

the current medical screening program for depleted uranium. This program is operated by DOD and the Department of Veterans Affairs (VA). We attempted to survey 194 veterans who had been notified about participation, and reached 128 veterans (66%) to discuss their experiences with the program. We also reviewed the services' depleted uranium training programs and the training records for selected Army units at Fort Bragg, North Carolina, and Fort Knox, Kentucky. Appendix I describes the scope and methodology for this report in more detail.

Results in Brief

The scientific understanding of depleted uranium's effect on health is still evolving. Because depleted uranium is a low-level radioactive heavy metal, the potential for health effects are twofold: effects from radiation and effects from chemical toxicity. Two recent expert reviews have concluded that current evidence suggests that it is unlikely that inhaled or ingested depleted uranium poses a radiation health hazard, namely cancer. In assessing health effects associated with chemical toxicity, both reviews cited the kidney as the organ that would show the first adverse health effects, and they noted that animal studies show that very high doses of uranium may cause kidney failure. However, both reviews observed that studies of uranium miners and mill workers have not shown increased kidney disease even though they were occupationally exposed to elevated levels of natural uranium. The Department of Veterans Affairs is currently evaluating 51 Gulf War veterans who are considered to have had the highest exposure to depleted uranium. Evaluations in 1997 of 29 of these veterans, many of whom have embedded fragments, indicate that, to date, none of these veterans show any evidence of adverse kidney effects associated with exposure to depleted uranium. However, most depleted uranium-exposed veterans with embedded fragments continue to have elevated uranium levels in urine, which were related, in some cases, to lowered performance on computerized tests assessing problem-solving efficiency[1] and to high levels of the prolactin hormone associated with reproductive health. The clinical significance and long-term health consequences of these findings are undetermined. Additional research is underway to more fully understand depleted uranium health effects and to better estimate the amount of depleted uranium exposure received by Gulf War veterans.

[1]Program clinical investigators cautioned that the number of veterans with elevated uranium levels was small and that a few veterans with complex histories may have contributed appreciably to the observed variance.

Some Gulf War veterans experienced problems in fully participating in the medical screening program established to ensure that veterans with higher than normal uranium levels are identified for appropriate monitoring and treatment. More specifically, the problems encountered by 19 (14.8%) of the 128 veterans we interviewed included not being contacted by the Department of Defense or the Department of Veterans Affairs to arrange an appointment at a medical facility, not receiving the required urine test designed to detect elevated uranium levels, and not being able to understand the test results. The Departments of Defense and Veterans Affairs subsequently corrected or planned to correct each administrative problem we identified.

The military services have developed depleted uranium safety training, which instructs servicemembers on how to identify and safely deal with depleted uranium contamination. The services have integrated the depleted uranium safety training into training courses for personnel in military occupations, such as Army tank gunners, where the exposure potential to depleted uranium is highest. In addition, the services have begun efforts to provide general awareness depleted uranium training to servicemembers on a more widespread basis, regardless of their military occupation. However, our review of general awareness depleted uranium training at 17 Army units, while not projectable to the Army as a whole, showed that the required training was not provided to all troops for various reasons, such as training materials not being available or servicemembers being away from their unit during the training. Furthermore, because neither the Army nor Marine Corps monitor depleted uranium training for deployments, they were unable to tell us whether troops who recently deployed to Kosovo, where depleted uranium munitions were used, had received depleted uranium training.

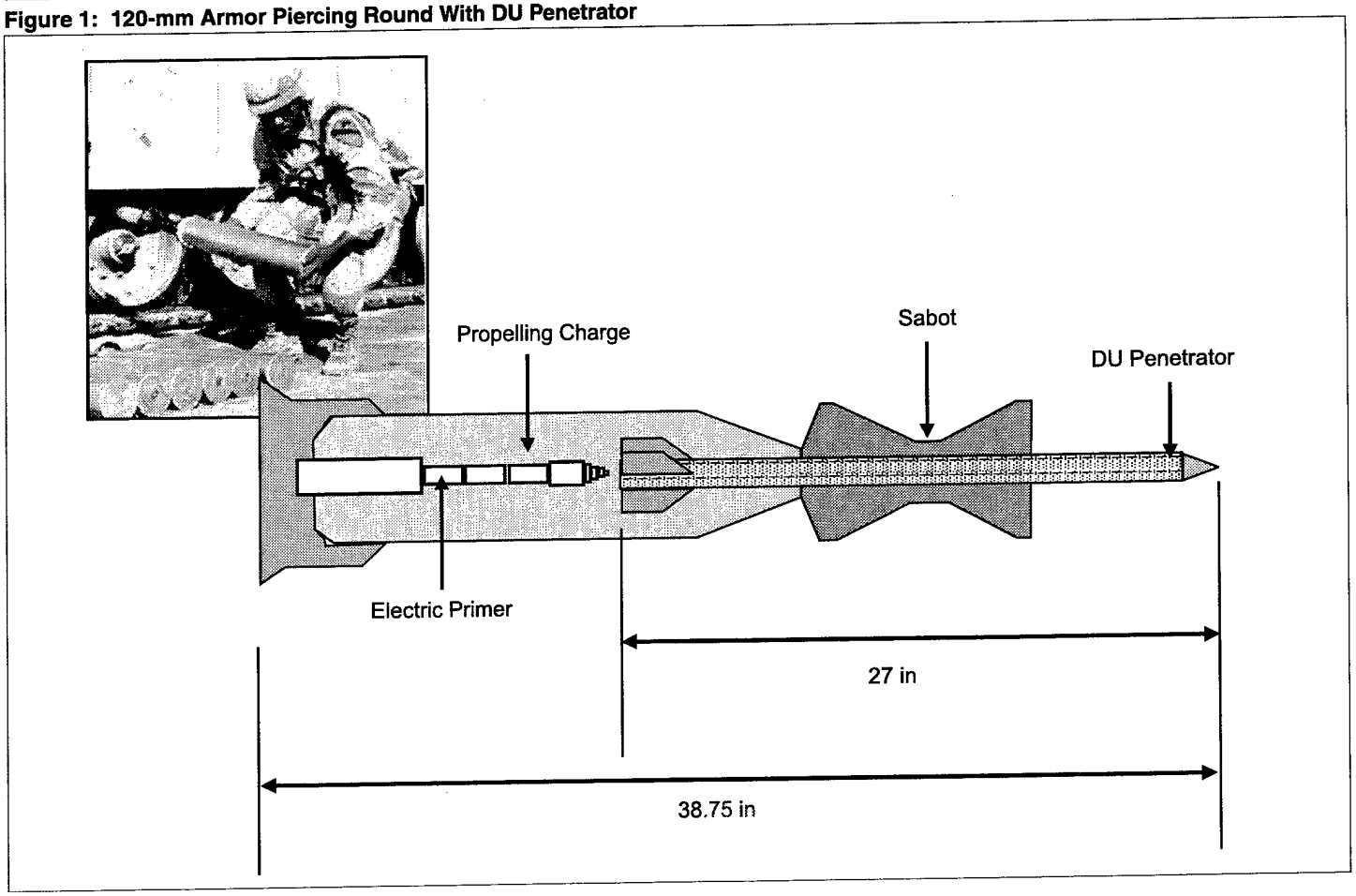
We are recommending that the Secretary of Defense ensure, by appropriate monitoring and periodic review of training records, that all servicemembers, including those deployed to Kosovo, receive required depleted uranium safety training.

Background

Depleted uranium (DU), a low-level radioactive heavy metal, is a by-product of the process used to enrich uranium. The United States uses DU in several of its armor-piercing munitions because its extreme density and its ability to penetrate targets make it an effective weapon; these same properties also enhance the protection of U.S. tanks when DU is incorporated into tank armor. Several other countries—including the

United Kingdom, Russia, Turkey, Saudi Arabia, Pakistan, Thailand, Israel, and France—are also reportedly developing or already possess weapon systems incorporating DU. A cross-section of a common armor piercing munition incorporating DU is displayed in figure 1.

Figure 1: 120-mm Armor Piercing Round With DU Penetrator



Source: U.S. Army.

When a DU munition penetrates a hard target, it breaks into fragments and fine particles that ignite easily, and it produces uranium dust particles that can be inhaled or ingested. During the Persian Gulf War, several situations occurred in which potentially hundreds of U.S. servicemembers could have been exposed to DU. These included incidents in which U.S. tanks mistakenly fired DU armor-piercing munitions into other U.S. combat vehicles. These friendly fire incidents exposed 102 surviving

servicemembers who were in or on the affected vehicles at the time they were struck to embedded DU fragments and/or inhalation and ingestion of DU particles as well as wound contamination. About 60 servicemembers who went into these vehicles to evacuate and rescue servicemembers may also have been exposed to DU by inhalation and ingestion. After the combat operations, about 191 other servicemembers may have been exposed, by inhalation and ingestion, when they entered DU-contaminated vehicles to remove unexploded munitions and to work in or on damaged or destroyed vehicles as they were prepared for repair or disposal. Personnel may also have been exposed to DU, by inhalation, during and following a fire at Camp Doha, Kuwait, in which DU munitions detonated and burned. Other personnel may have been exposed to DU as they passed through and inhaled smoke from burning DU, handled spent DU munitions, or entered DU-contaminated vehicles on the battlefield or in salvage yards. More recently, U.S. aircraft used DU munitions in Kosovo; troops currently deployed there may be exposed to DU particles as part of their peacekeeping operations.

Following their service in the Persian Gulf War, many veterans experienced health problems such as fatigue, muscle and joint pain, gastrointestinal complaints, headaches, memory loss, and sleep disturbances. The causes of these illnesses have been the source of much controversy over the past 8 years. In November 1996, the Deputy Secretary of Defense established the Office of the Special Assistant for Gulf War Illnesses to ensure, among other things, that DOD does everything possible to understand and explain illnesses in Gulf War veterans. The Office of the Special Assistant has completed several investigations, with several still ongoing, into possible causes for the illnesses, including possible exposure to DU, chemical or biological agents, oil well fires, and pesticides.

On August 4, 1998, the Office of the Special Assistant issued its interim environmental exposure report on DU.[2] The Office of the Special Assistant's methodology for its investigation of DU as a potential cause of Gulf War illnesses included (1) identifying who was exposed to DU and how, (2) identifying the known medical effects of human exposure to DU, (3) identifying how much DU personnel were exposed to, and (4) assessing the health risks of the DU exposures. As part of this investigation, RAND, under contract with DOD, conducted a review of medical and scientific

[2]*Environmental Exposure Report: Depleted Uranium in the Gulf*, Office of Special Assistant for Gulf War Illnesses (Washington, DC: Aug. 1998).

literature on DU's known medical and health effects. The scope of RAND's review covered literature published or accepted for publication in peer-reviewed journals, books, government publications, and conference proceedings. Also, the U.S. Army Center for Health Promotion and Preventive Medicine estimated the amount of DU that may have been taken into the body for personnel in, on, or near vehicles at the time they were struck by DU munitions.

In 1993, the DU Follow-up Program was established at the Baltimore Veterans Affairs Medical Center because of concerns about the possibility of long-term health effects from embedded DU fragments in servicemembers injured during Gulf War friendly fire incidents. In 1993 and 1994, the program evaluated the health of 33 Gulf War veterans who were known to have been exposed to aerosolized DU and, in about half the cases, who obtained embedded fragments during friendly fire incidents and may have received some of the highest doses. Twenty-nine of the originally evaluated 33 veterans were reevaluated between March and June 1997. The program, which is still underway, collected information on medical, social, family, reproductive, and occupational exposure histories. In addition, participating veterans received physical examinations and neuropsychological, radiological, reproductive, and kidney function tests during 3-day hospital stays.

In July 1998, DOD and VA established an expanded medical screening program to evaluate servicemembers potentially exposed to DU. Although the screening program is available for any Gulf War veteran, the Office of the Special Assistant attempted to notify and offer the screening to Gulf War veterans who were likely to have experienced the highest DU exposures, which included those who were in or on vehicles that were struck by DU munitions and those who worked around DU-contaminated vehicles. The program includes a urine test designed to identify elevated uranium levels, a DU-exposure questionnaire, and a medical examination. Thirty servicemembers, who had been involved in the friendly fire incidents, were identified through this new expanded screening program and accepted invitations to participate in the Baltimore VA Depleted Uranium Follow-up Program, which seeks to include all servicemembers involved in friendly fire incidents. The program evaluated these 30 new participants and 21 of the original participants between March and July 1999.

Because DU is a low-level radioactive heavy metal, DOD believes that servicemembers' exposures to it should be kept as low as reasonably

achievable. Consequently, in 1993 DOD required the Army to provide training on how to identify and safely operate in a DU-contaminated environment and required the other services to assess their DU training needs as well.

Known Health Effects Related to DU Exposure

Reviews of the scientific literature conducted by RAND and the Agency for Toxic Substances and Disease Registry (an agency within the Department of Health and Human Services) concluded that current evidence suggests that radiation from inhaled or ingested depleted uranium is an unlikely health hazard. RAND also concluded that the occurrence of radiation-related effects (such as cancer) from embedded depleted uranium fragments would depend on the size of the fragment and its proximity to vital organs.

Both reviews observed that the kidney is the organ that shows the first effects from depleted uranium's chemical toxicity as a heavy metal. Although laboratory tests on animals indicate adverse kidney effects at high doses, epidemiological studies of humans occupationally exposed to uranium have not found an increase in kidney disease. Similarly, a VA study of 29 Gulf War veterans believed to have been exposed to the highest levels of depleted uranium has found, to date, no evidence of adverse effects on the kidney, but it has found that most DU-exposed veterans with embedded fragments continue to excrete elevated levels of urinary uranium. These elevated levels were related, in some cases, to "subtle perturbations" in the reproductive and central nervous systems.[3] The clinical significance and long-term health consequences of these findings are undetermined. Additional research is underway to more fully understand DU's health effects and to better estimate the amount of depleted uranium exposure received by Gulf War veterans.

[3]Melissa A. McDiarmid, et al., "Health Effects of Depleted Uranium on Exposed Gulf War Veterans," *Environmental Research*, Vol. 82 (2) (Feb. 2000), pp. 168-180.

RAND and the Agency for Toxic Substances and Disease Registry Analyses of DU Health Effects

Both RAND and the Agency for Toxic Substances and Disease Registry have recently reviewed the scientific literature on possible health effects from uranium.[4] RAND found that little published scientific information exists on the health effects of depleted uranium, but a wide body of relevant literature exists on natural and enriched uranium. Studies of the latter forms of uranium are considered relevant to depleted uranium health effects because DU is less radioactive than natural or enriched uranium, and it is identical to them in chemical toxicity. RAND and the Agency reviews examined the literature in regard to both radiation and chemical toxicity health effects.

Regarding radiation health effects, some types of cancer have been associated with radiation exposure in humans. Both RAND and Agency reviews found that no human cancer attributable to radiation from natural uranium is documented in the literature. Since natural uranium is more radioactive than DU, these results indicate that DU represents an even lesser risk of causing cancer. According to the Agency, radiation from inhaled uranium is associated with a low risk of cancer, with the main risk occurring with co-inhalation of other toxic and/or carcinogenic agents, such as radon. Similarly, RAND reported that no peer-reviewed published reports show detectable increases of cancer or other negative health effects from radiation exposure to inhaled or ingested natural uranium even at levels far exceeding those likely in the Gulf War. RAND concluded that it would be virtually impossible to obtain enough inhaled or ingested depleted uranium to present a significant internal exposure. For embedded depleted uranium fragments, RAND concluded that radiation-related effects depend on the size of the fragment and its proximity to vital organs.

Regarding DU's chemical toxicity, RAND and the Agency cited the kidney as the organ that would show the first adverse health effects from DU. Both indicated that animal studies have shown that uranium can cause changes in kidney function and at very high doses result in kidney failure. The

[4] *A Review of the Scientific Literature as It Pertains to Gulf War Illnesses, Vol. 7, Depleted Uranium*, prepared by RAND's National Defense Research Institute for the Office of the Secretary of Defense (Santa Monica, Calif.: 1999), and *Toxicological Profile for Uranium (Update)*, prepared by Research Triangle Institute for Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Public Health Service (Atlanta, Ga.: Sept. 1999). The Agency's toxicological profile was prepared pursuant to section 104(i) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9604(i) (1994), for hazardous substances found at Department of Energy waste sites, including the toxicologic and adverse health effects for uranium.

Agency reported that the kidney effects observed in animals can also occur in humans if the uranium dose is high enough. However, both reviews reported that epidemiological studies of uranium miners and mill workers occupationally exposed to elevated concentrations of natural uranium have shown no increased kidney disease. Moreover, the Agency reported that the available data on uranium compounds are sufficient to conclude that uranium has a low order of chemical toxicity in humans in view of the high exposures to which humans and animals in studies were exposed without adverse effects in many cases.

Both RAND and the Agency also reported that there are few studies addressing the human reproductive effects of uranium. The Agency reported that uranium may have adverse effects on fetal development because animal studies have observed reproductive effects from ingestion of uranium. However, RAND reported that the concentrations of uranium used to elicit the effects observed in the animal studies were much greater than the highest exposure that would occur in military or industrial settings. RAND concluded "to the extent that reproductive health issues related to uranium have been investigated to date, there have not been findings that would suggest a relationship between levels of exposures that could have occurred in the Persian Gulf and those that are associated with adverse outcomes in animal experiments."

Based on their reviews of the scientific literature, both RAND and the Agency outlined additional research efforts that could more fully assess the health effects of DU. The Agency suggested several areas for further research, including the health effects on reproductive functioning. RAND also suggested additional research, including long-term epidemiological studies on Gulf War veterans and continuation of the Baltimore VA Depleted Uranium Follow-up Program.

VA Evaluation of Gulf War Veterans

Even though most of the DU-exposed veterans with embedded fragments in the Baltimore VA Depleted Uranium Follow-up Program are continuing to excrete elevated levels of urinary uranium, to date the data show no evidence of adverse effects on the kidney—the organ presumed to show the first effects from exposure to DU.[5] Program clinical investigators also found uranium in the semen of some, but not all, program participants. The clinical investigators found a relationship between elevated urinary uranium levels and high levels of the prolactin hormone associated with reproductive health—many of the prolactin hormone levels were within the upper bounds of the normal range. The clinical investigators also noted, however, that as of January 2000, about 20 infants fathered by DU-exposed participants display no observable birth defects. Finally, the clinical investigators found a statistical relationship between elevated uranium levels and lowered performance on computerized tests assessing problem-solving efficiency. The clinical investigators urged caution about drawing conclusions about these test results because of the small number of veterans with elevated uranium levels in the study group; also, it appeared that a few veterans with complex histories may have contributed appreciably to the observed variance. The program director told us that the clinical significance of these findings is currently unknown; however, the director described these "subtle perturbations" as not normal.

[5]Information reported to date on the health effects of DU from this program are based on findings from 29 of the original 33 participants who have been monitored since the program began in 1993. More recent results should be available during the summer of 2000. These results will be based on medical evaluations conducted between March and July 1999 of 51 participants, including 21 of the original participants.

Studies in Progress

Studies are underway that include analyses of the health effects from exposure to DU. The National Academy of Science's Institute of Medicine, under contract with VA, is conducting a review of the scientific literature regarding adverse health effects associated with various Gulf War exposures. This review will assess whether exposures, or combinations of different types of exposures, are associated with illnesses experienced by Gulf War veterans. The first phase of the review focuses on health effects to several exposures, including DU, nerve agents, vaccines, and pyridostigmine bromide. The review is scheduled for completion in August 2000.[6]

In response to the complaints of many servicemembers who returned from the Gulf War with health problems they believed were associated with their deployment, DOD and VA established two programs to monitor their health—DOD's Comprehensive Clinical Evaluation Program in 1994 and the VA's Persian Gulf Registry in 1992. Both programs include databases that contain health and potential exposure information on servicemembers who had received clinical evaluations as a part of the program. DOD and VA are currently engaged in a joint study to analyze the health conditions and possible hazard exposures in the combined databases which, as of December 1999, included information for over 100,000 U.S. Gulf War veterans. This study will examine the relationship between health effects and possible exposure to a variety of hazards, including pesticides, insect repellants, oil well fire smoke, anthrax vaccinations, and DU. The results of this study are expected to be published by December 2000.

The Armed Forces Radiobiology Research Institute is also conducting a series of animal studies to assess the health effects of embedded DU pellets. The studies are examining the redistribution and toxicity of DU fragments, the carcinogenic potential of DU, and the effect of DU on reproduction and fetal development. According to an Institute official, these studies are expected to be completed within 2 to 3 years. The Lovelace Respiratory Research Institute is also conducting an animal study examining the carcinogenic potential of embedded DU pellets as well as various cellular, biophysical, and biochemical effects. This study is expected to be completed in April 2000.

[6]Persian Gulf War Veterans Act of 1998, P. L. 105-277, §1603, 112 Stat. 2681, 2681-745 (Oct. 21, 1998) and Veterans Programs Enhancement Act of 1998, P. L. 105-368, § 101, 112 Stat. 3315, 3317 (Nov. 11, 1998), each of which mandates a review regarding the associations between illnesses and Gulf War service.

Unreliable Dose Estimates for Servicemembers in, on, or near Vehicles When Struck by DU Munitions

DOD estimates describing the extent of DU inhalation exposure of about 162 servicemembers who were in or on vehicles when they were struck by DU munitions in friendly fire incidents and for those entering the vehicles immediately after impact in the Gulf War are unreliable because of questionable assumptions used in the analysis. Reliable DU exposure estimates are important for assessing the potential for adverse health effects from exposure to DU and will augment the medical outcome data available from the clinical monitoring of servicemembers involved in the friendly fire incidents.

In August 1998, the U.S. Army Center for Health Promotion and Preventive Medicine issued its interim DU exposure assessment for servicemembers who were in or on vehicles when they were struck by DU munitions in friendly fire incidents and for those entering the vehicles immediately after impact. It is believed that these individuals received the highest exposures to DU during the Gulf War. We reviewed the methodology used by the Center in preparing its estimates and found that it had relied extensively on a single test conducted in 1987, which involved DU munitions striking an Abrams M1A1 tank equipped with DU armor. [7] We found that the conditions present during the 1987 test and those present during the Gulf War for the friendly fire incidents differed significantly, which could result in higher or lower dose estimates than the Center's 1998 dose assessment. For example, the 1987 test measured the DU dose resulting from less than a minute of exposure, while the 1998 assessment assumes that servicemembers were exposed in the vehicles for 15 minutes during the Gulf War. Similarly, the 1987 test results may have underestimated the amount of DU exposure because the test assumed a less intense breathing rate than believed to be experienced by Gulf War veterans. While these differences suggest that the 1998 assessment on Gulf War veterans' DU exposure level may be understated, other differences suggest that they could be overstated. For example, in the 1987 test DU munitions penetrated the DU armor of a tank, which may produce more aerosolized DU than would be the case had it struck a non-DU armor portion of the vehicle. In the Gulf War, DU munitions did not penetrate DU armor. Also, in the Gulf War many friendly fire incidents involved Bradley Fighting vehicles, which are not DU armored and therefore should not have produced levels as high as in the 1987 test.

[7] Richard L. Fliszar, Edward F. Wilsey, and Ernest W. Bloore, *Radiological Contamination From Impacted Abrams Heavy Armor*, U.S. Army Laboratory Command, Ballistic Research Laboratory, Technical Report BRL-TR-3068 (Maryland: Dec. 1989).

In response to our and congressional concerns about the accuracy of the Center's dose estimates,[8] the Special Assistant for Gulf War Illnesses (who also serves as the Under Secretary of the Army) in October 1999 directed that the Army conduct further testing as soon as possible. The new test will be designed to develop more reliable estimates on how much DU servicemembers were exposed to during the Gulf War and to provide as much information as possible on the implications of similar exposures in future engagements. According to an Army official, the new live-fire test design and plan are currently being developed, and they will make extensive use of subject area experts in designing, conducting, and reporting the test results. Army officials estimate that it will take about 17 months to complete and interpret the results of the new tests.

The Center is also developing exposure estimates for those Gulf War veterans who experienced lower-level exposures to DU. The Special Assistant for Gulf War Illnesses noted that these estimates are not based on the same test data used in developing the exposure estimates for those individuals in or on the vehicles involved in the friendly fire incidents and, therefore, are not subject to scientific disagreement. The Center's preliminary exposure estimates for other lower-level exposure categories were not available for our review as of December 1999, but were being reviewed within DOD.

Administrative Problems Hinder Full Participation in Screening Program for Some Veterans

To ensure that those Gulf War veterans with higher than normal uranium levels are identified for appropriate monitoring and treatment, DOD and VA established an expanded medical screening program in 1998. Our survey of 128 servicemembers found that 109 veterans we interviewed did not experience administrative problems, but 19 (14.8%) veterans did experience problems (such as in arranging an appointment at a DOD or VA hospital) that hindered their full participation.

Although the medical screening program is available to any Gulf War veteran, the Office of the Special Assistant directly contacted only those veterans suspected of receiving the highest levels of exposure to DU. These included veterans (1) who were in or on U.S. vehicles when they were struck by DU munitions in friendly fire incidents, (2) who entered these

[8]On September 24, 1999, Representative Lane Evans, Representative Bob Filner, and Senator Russell Feingold cosigned a letter to the Secretary of Defense requesting the Secretary to immediately investigate the issue and to direct a new dose reconstruction, if appropriate.

vehicles to perform rescue operations, or (3) whose duties required them to make numerous trips into DU-contaminated vehicles. The process of identifying veterans in these groups has continued since the program started in July 1998. As of August 1999, when we began our survey, the Office of the Special Assistant had contacted 210 veterans who they believed were exposed to the highest levels of DU and asked them to participate in the screening program.

We attempted to interview 194 of the 210 veterans who had been contacted by the Office of the Special Assistant to ask them about their experiences with the program.[9] We were able to interview 128 (66%) of the 194 veterans. Sixty (47%) of those we contacted were participating in the program. Six (10%) of these veterans had experienced problems related to the 24-hour urine test; more specifically, three had not been given the required 24-hour urine test, and three had difficulty in interpreting the urine test results.[10]

We asked the 55 veterans who said that they were not participating but planned to at a later time about their reasons for not yet participating. We found that 13 (23.6%) were not participating because they were waiting for an appointment—6 at DOD medical facilities and 7 at VA medical centers. When these veterans were notified by the Office of the Special Assistant about the screening program and indicated their desire to participate, they were told that someone would call them to arrange an appointment. However, no one had contacted them about an appointment. Nine of these 13 veterans had been waiting at least 11 months for an appointment. The administrative problems found in our survey occurred because DOD and VA did not adequately monitor the status of individuals who had indicated a desire to participate in the program to ensure all phases of the screening were complete. We discussed the problems we identified with DOD and VA officials, who either corrected or developed plans to correct them.

Thirteen veterans who were notified for participation were not participating and had no plans to do so. When we asked these veterans for their reasons for not participating, none claimed that administrative problems deterred them. In addition, they did not claim that DOD had not informed them of their possible exposure, and they did not cite a lack of

[9]We did not attempt to interview 16 veterans because they were located outside the contiguous United States when we were doing our survey.

[10]The 24-hour urine test identifies the uranium level in a urine sample collected over a 24-hour period.

trust in DOD or VA as a reason for not participating. Many of the veterans reported more than one reason for not participating. The most frequently cited reasons are as follows:

- Their health had not been affected from exposure to DU (11 respondents).
- They did not believe that they were exposed to DU (7 respondents).
- Job demands or a lack of money or time had prevented them from participating (7 respondents).

DU Training Programs Established but Not Fully Implemented

The lack of DU training and delays in providing it have been long-standing issues for the services. In January 1993, we reported that the Army had not effectively educated its Gulf War personnel about the hazards of DU contamination and proper safety measures, and we recommended that the services provide appropriate training to those servicemembers who may be exposed to DU.[11] In June 1993, the Deputy Secretary of Defense directed the Army to ensure that DU training was provided to servicemembers and required the other services to also assess their DU training needs. In April 1998, the Special Assistant for Gulf War Illnesses reported that the services had not made sufficient progress in implementing DU training and that servicemembers were only marginally better prepared to contend with DU hazards than they had been during the Gulf War.

To review the status of DU training provided by the services, we visited each of the service headquarters and several Army schools where DU training is conducted. We found that each service provides DU training for military occupations considered to have the greatest likelihood for DU exposure, such as Army chemical unit personnel, Army tank gunners who would fire DU rounds in combat, Navy personnel who operate the Phalanx weapons system (which also fires DU rounds), and Air Force explosive ordnance disposal personnel. Since the beginning of fiscal year 1995, DU training modules have been included in 21 military skill specialty and noncommissioned officer and officer leadership courses taught to over 26,000 personnel. Each service has also provided DU training to medical personnel who are responsible for treating troops who may be wounded by DU munitions.

[11] *Operation Desert Storm: Army Not Adequately Prepared to Deal With Depleted Uranium Contamination* (GAO/NSIAD-93-90, Jan. 29, 1993).

Beginning in 1998, the services initiated efforts to provide DU training to the general population of troops on a more widespread basis, regardless of their military occupations, either as part of basic training, unit readiness training, or predeployment training for personnel subject to duty in areas where they may encounter DU. The services vary in their approaches to providing this general awareness DU training. For example,

- the Air Force requires general awareness DU training for all personnel subject to mobilization and deployment and as part of basic training;
- the Navy targets its general awareness training to specific types of shipboard personnel it believes most likely to encounter DU in a conflict, such as corpsmen, damage control personnel, and ammunition handlers;
- the Marine Corps plans to make DU general awareness training a requirement for enlisted personnel in all units during fiscal year 2000 and to include DU training in several officer-level courses; and
- the Army incorporated DU tasks into the required unit level common task test[12] for 5 consecutive years (fiscal years 1999 through 2003).

Appendix II provides more detailed information on the numerous training modes each service has taken or plans to take to implement DU training.

To determine if soldiers are receiving the required DU awareness training, we reviewed training records at selected Army sites. We chose the Army for our review because, as the service with the largest numbers of ground troops, it is the service with the greatest likelihood of having large numbers of troops exposed to DU on the battlefield. Also, the Army formally required the general awareness DU training and stressed the importance of common task training as its mechanism for providing it. The Army, however, does not centrally track the extent to which servicemembers are provided the required common task test training components; that information is kept at the individual unit level. Because no central records were available, we selected several Army units to test the implementation of DU general awareness training.

We reviewed fiscal year 1999 common task training and testing records at 16 Army units at Fort Bragg, North Carolina, and 1 unit at Fort Knox,

[12]Common task training includes a number of critical combat and survival skills in which the Army requires all soldiers to be routinely trained and tested—every year for active soldiers and every 2 years for reserve soldiers.

Kentucky. The review, which included over 1,600 personnel, indicated that only 65 percent received the required DU training. We also found a great deal of disparity among units in that three units had not conducted the required DU training at all, while four units had provided the training to almost everyone (over 90%) in the unit. Appendix III shows in more detail the results of our review.

Reasons given for not providing the required DU training to all units and personnel included the following:

- Another common task was substituted for the DU task because the unit did not have the DU training materials available or lacked the expertise to conduct the training.
- Scheduled DU training was superseded by a larger scale training deployment requirement.
- Common task training and testing was interrupted by a hurricane.
- Some individuals were on leave, sick, or away at other training during the conduct of common task training.

All the above reasons for not providing DU training to unit personnel could have been overcome or avoided if the common task training had been scheduled early in the year so that (1) needed equipment could have been obtained, (2) the training could have been rescheduled if other priorities or conflicts arose, and (3) personnel away from the unit at the time of the training could have been trained when they transferred into or returned to the unit.

Because DOD and the services do not monitor DU training for deployments, Army and Marine Corps officials in Washington, D.C., and Europe were unable to tell us whether Army and Marine Corps troops who recently deployed to Kosovo had received DU training prior to or during the deployment. This lack of information is potentially significant because our forces in Kosovo used DU munitions. Army officials said that since DU is a common task training item, the units in Kosovo should have received the training at some time during fiscal year 1999, but they could not confirm that the training had occurred. Marine Corps officials said that the Marine Corps had no policy or directive to provide DU training to deploying troops and would do so only if directed by the responsible commander in chief.

Conclusions

We believe that the Under Secretary of the Army acted appropriately in directing the Army to conduct new live-fire DU tests. Proper analyses of the test results should provide more reliable estimates of the level of DU exposure experienced by servicemembers who were in or on the vehicles involved in friendly fire incidents during the Gulf War or who may be exposed to DU in future engagements. Because of the Army's apparent commitment on this issue, we are not making any recommendations but we plan to monitor the Army's conduct of this testing.

U.S. servicemembers continue to use DU munitions and may be exposed to them from other sources as a growing number of other countries incorporate DU into their weapon systems. Because depleted uranium is a low-level radioactive heavy metal, servicemembers' exposure to it should be kept as low as reasonably achievable. The services, therefore, need to do more to ensure that servicemembers receive safety training on how to properly operate in a DU-contaminated battlefield. Proper implementation of the training programs is essential to achieving a necessary level of protection. While our review of training records was limited to the Army, the importance of training implementation is applicable to the other services because they also employ DU in their combat systems and could encounter damage from enemy DU munitions. Given that DU munitions were used in Kosovo and U.S. servicemembers are deployed to the region, we believe that it is especially important to know whether they have received DU safety training.

Recommendations

To provide that both active and reserve component servicemembers receive depleted uranium safety training, we recommend that the Secretary of Defense

- direct the secretary of each military department to ensure, by appropriate monitoring and periodic reviews of training records, that active and reserve component servicemembers receive required annual or biennial depleted uranium safety training and
- identify whether servicemembers currently deployed to Kosovo have received depleted uranium safety training, and if not, provide it promptly.

Agency Comments and Our Evaluation

In commenting on a draft of this report, DOD concurred with our recommendations that the Secretary of Defense ensure that all servicemembers, including those deployed to Kosovo, receive required depleted uranium safety training. DOD further described actions it has already taken to emphasize the importance of this training.

DOD also stated that we accurately reported the findings from two recently published reviews of medical literature related to depleted uranium health effects. DOD took exception, however, to our presentation of the Baltimore Depleted Uranium Follow-up Program findings in the Results in Brief. DOD stated that we did not include key caveats related to those veterans with embedded fragments, a small number of veterans with complex histories, and the clinical significance of the findings. We revised the Results in Brief to more completely reflect these caveats.

In follow-up to VA's written comments, the VA's Chief Officer, Public Health and Environmental Hazards, Veterans Health Administration, agreed with the findings and conclusions in the draft report and stated that they have taken action to correct the problems that we identified during our audit work.

DOD and VA comments are presented in their entirety in appendixes IV and V, respectively. DOD and VA also provided oral and technical comments, which we have incorporated as appropriate.

We conducted our review from March 1999 through January 2000 in accordance with generally accepted government auditing standards.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies of this report to appropriate congressional committees. We will also send copies to the Honorable William S. Cohen, Secretary of Defense; the Honorable Togo D. West, Jr., Secretary of Veterans Affairs; and the Honorable Bernard Rostker, Special Assistant to the Deputy Secretary of Defense for Gulf War Illnesses. Copies will also be sent to other interested parties upon request.

If you have any questions about this report, please call me at (202) 512-3610 or the contacts listed in appendix VI.

Norman Rabkin

Norman J. Rabkin
Director, National Security
Preparedness Issues

Scope and Methodology

To perform our review, we obtained relevant documents and reports about potential depleted uranium (DU) health effects from various sources, including the Department of Defense's (DOD) Office of the Special Assistant for Gulf War Illnesses; RAND; the U.S. Army Center for Health Promotion and Preventive Medicine; the Baltimore Veterans Affairs (VA) Depleted Uranium Follow-up Program; the Persian Gulf Veterans Coordinating Board; the Department of Veterans Affairs; the Offices of the Surgeons General at the Army, the Navy, and the Air Force; the Institute of Medicine; and the National Gulf War Resource Center, Inc. We analyzed this documentation and discussed in detail issues related to potential DU health effects with representatives of these organizations.

To identify what is generally known about health effects from exposure to DU, we analyzed RAND's report, published in 1999, on its review of the scientific literature about the health effects of depleted uranium. We met with RAND representatives and discussed the methodology used for its review and the process used for quality assurance. In addition, we reviewed the Toxicological Profile for Uranium prepared by the Agency for Toxic Substances and Disease Registry, a federal agency within the Public Health Service of the U.S. Department of Health and Human Services, which was issued in September 1999 after a public comment period. We met with representatives of the Persian Gulf Veterans Coordinating Board and discussed federally funded research projects on depleted uranium health effects. In addition, we met with Institute of Medicine representatives and discussed the methodology and status of their review of the scientific and medical literature regarding adverse health effects associated with various exposures experienced during the Gulf War.

To identify evidence regarding possible negative health effects experienced by servicemembers as a result of DU exposure during the Gulf War, we discussed the findings of the Baltimore VA Depleted Uranium Follow-up Program with program officials and reviewed program documentation. We discussed with representatives of DOD's Comprehensive Clinical Evaluation Program and the VA's Persian Gulf Registry completed and planned analyses of program data related to possible health effects from exposure to DU.

To assess the reasonableness of the DU exposure estimates for servicemembers involved in DU friendly fire incidents, we reviewed the methodology used by the U.S. Army Center for Health Promotion and Preventive Medicine at Aberdeen Proving Ground, Maryland. In analyzing the methodology, we discussed with Center officials the basis for various

components of the methodology. In reviewing the dose estimation methodology, we also met with the principal author of a 1989 test report and other officials at the U.S. Army Picatinny Arsenal to discuss the reasonableness of the Center's use of data from the earlier test.

To identify whether Gulf War veterans were experiencing administrative problems in participating in the current DOD/VA DU medical screening program, we surveyed by telephone servicemembers who had been contacted by the Office of the Special Assistant for Gulf War Illnesses. The Office of the Special Assistant contacted those Gulf War veterans believed to have received the highest levels of exposure to DU to encourage them to participate in the program. We developed and pretested a structured interview protocol that we subsequently used in surveying the servicemembers. As of August 11, 1999, the Office of the Special Assistant had contacted 210 individuals about the screening program.[1] Because of the difficulty in reaching servicemembers located outside the United States, we did not attempt to reach the 16 individuals who were located outside the contiguous United States. We subsequently attempted to contact 194 individuals who were believed to be in the United States at the time of our survey. We located and interviewed 128 individuals about their experiences with the medical screening program. We analyzed the survey results and subsequently communicated information about those instances in which program administrative problems were cited to DOD and VA officials. We provided DOD and VA officials an opportunity to investigate the problem cases and provide us with any documentation that refuted the allegations. In those instances where the DOD or VA officials provided evidence that effectively refuted the servicemembers' allegations, we revised our summary results. Specifically, 10 veterans told us about administrative problems that were not substantiated by information or documentation provided by DOD or VA— such as not completing the urine tests, not receiving the test results, and not being notified to set up an appointment.

To assess whether the services have implemented programs to train servicemembers on how to operate safely in a DU-contaminated

[1]The Office of the Special Assistant has continued to notify veterans about the program. From August 1999 to January 2000, the Office of the Special Assistant contacted 12 additional veterans. As discussed in the report, DOD and VA have made this program available to any Gulf War veteran who believes that he or she may have been exposed to DU. As of December 31, 1999, a total of 269 veterans have entered the screening program through this avenue as self-referrals.

environment, we interviewed officials and obtained relevant documentation by visiting or contacting the following locations:

- Department of Defense
  - The Office of the Special Assistant for Gulf War Illnesses, Falls Church, Va.
- Department of the Army
  - Office of the Deputy Chief of Staff for Operations, Army Training, Headquarters, Department of the Army, Pentagon, Washington, D.C.
  - Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, Va.
  - Headquarters, U.S. Army Medical Command, Fort Sam Houston, Tex.
  - Headquarters, U.S. Army Europe, Heidelberg, Germany
  - Headquarters, 7th Army Training Command, Grafenwoehr, Germany
  - Headquarters, V Corps, Heidelberg, Germany
  - U.S. Army Chemical School, Fort Leonard Wood, Mo.
  - U.S. Army Ordnance Centers and Schools, Aberdeen Proving Ground, Md.
  - Redstone Arsenal, Ala.
  - Headquarters, U.S. Army Infantry Center and Fort Benning, Fort Benning, Ga.
  - Continental U.S. Replacement Center, Fort Benning, Ga.
  - U.S. Army Armor Center, Fort Knox, Ky.
  - U.S. Army Combined Arms Center and Fort Leavenworth, Fort Leavenworth, Kans.
- Department of the Navy
  - Radiological Controls & Health Branch, Office of the Chief of Naval Operations, Pentagon, Washington, D.C.
  - U.S. Navy Bureau of Medicine and Surgery, Washington, D.C.
  - Chief of Naval Education and Training, Pensacola, Fla.
  - U.S. Navy Fleet Combat Training Center, Atlantic, Virginia Beach, Va.
- Department of the Air Force
  - Office of the Deputy Assistant Secretary for Environmental Safety and Occupational Health, Office of the Secretary of the Air Force, Washington, D.C.
  - Civil Engineering Directorate, Headquarters, U.S. Air Force, Washington, D.C.
  - Office of the Air Force Surgeon General, Bolling Air Force Base, Washington, D.C.
- U.S. Marine Corps
  - Radiation Safety Office, Marine Corps Safety Division, Headquarters, U.S. Marine Corps, Arlington, Va.

- Health Services, Headquarters, U.S. Marine Corps, Arlington, Va.
- Marine Corps Combat Development Center, Quantico Marine Corps Base, Quantico, Va.

To review the implementation of DU safety training, we focused on the Army because, as the service with the largest numbers of ground troops, it is the service with the greatest likelihood of having large numbers of troops exposed to DU on the battlefield. In reviewing the Army's implementation of its broadscale DU general awareness training for soldiers, we visited selected active Army units and reviewed their common task training records for fiscal year 1999. In performing our review we compared the DU portion of the common task training records to the unit rosters to determine how many soldiers in each unit had been trained and tested on DU. Our review included visits to the 17 units listed below, some of which are rapid deployment units.

- Fort Bragg, North Carolina
  - A Company, 3rd Battalion, 505th Parachute Infantry Regiment
  - C Company, 3rd Battalion, 505th Parachute Infantry Regiment
  - D Company, 3rd Battalion, 505th Parachute Infantry Regiment
  - Headquarters and Headquarters Company 3rd Battalion, 505th Parachute Infantry Regiment
  - D Troop, First Squadron, 17th Cavalry Regiment
  - C Company, 307th Engineer Battalion
  - 82nd Military Police Company
  - C Battery, 3rd Battalion, 4th Air Defense Artillery Regiment
  - C Company, 82nd Signal Battalion
  - Headquarters and Service Company, 313th Military Intelligence Battalion
  - C Company, 27th Engineer Battalion, 20th Engineer Brigade
  - B Company, 27th Engineer Battalion, 20th Engineer Brigade
  - C Company, 37th Engineer Battalion, 20th Engineer Brigade
  - B Battery, 1st Battalion, 377th Field Artillery Regiment, XVIII Airborne Corps Artillery
  - C Battery, 1st Battalion, 321st Field Artillery Regiment, XVIII Airborne Corps Artillery
  - A Battery, 3rd Battalion, 27th Regiment, XVIII Airborne Corps Artillery
- Fort Knox, Kentucky
  - 233rd Combat Heavy Equipment Transport Company

DOD and VA provided written comments on a draft of this report. These comments are discussed on page 21 and are reprinted in appendixes IV and V.

Military Services' Depleted Uranium Safety Training

This appendix describes, in detail, the depleted uranium safety training developed by each military service.

Army

The Army included DU training for personnel in its M-1 tank Master Gunner Course in 1991 and in the Armor Officer Basic Course and Armor Captain Career Course in 1995. Depleted uranium training was introduced into the noncommissioned officer Ammunition Specialist Course in 1994, and into the Nuclear, Biological, and Chemical Course in 1995. In 1996, DU training was added to four different ordnance courses and to the Army's Ammunition Technician Course. DU training was introduced into the Infantry Bradley Fighting Vehicle Course in 1997 and into two additional Bradley vehicle courses in 1999. In 1998, DU training was included in the Army's Pre-Command Course for Lieutenant Colonels and Colonels prior to their first command assignment. Army officials could not give the actual date for when DU training was included in the Advanced Individual Training course for explosive ordnance disposal personnel or the core level Ammunition Specialist Course, but they said DU was not introduced into these two courses until after the Gulf War.

In October 1998, DU training was included as a common task in the Army's list of required unit-level training tasks, and DU will be included in the common task test for a 5-year period from fiscal year 1999 to 2003. In addition, on three different occasions in 1999, the Army used its worldwide satellite broadcasting system to televise DU training information to Army units worldwide. The same system was used on two earlier occasions in 1998 to broadcast DU-related medical treatment information to military medical personnel in all the services worldwide. In April 1999, the Army Medical Command established a requirement that all physicians and other applicable health care providers be trained on the Army's policy for treating personnel wounded by depleted uranium munitions. Also, as of February 2000, according to the Army's Training and Doctrine Command, DU training is now a mandatory part of officer precommissioning training for all new officers, and warrant officers will receive mandatory DU training during preappointment training as well.

During our visit to units at Fort Bragg, N.C., the XVIII Airborne Corps Chemical Officer told us that the Corps conducts a 2-week training course to train alternate nuclear, biological, and chemical officer and noncommissioned officer personnel from individual units at Fort Bragg, and that the course began including DU training informally in October 1998 and formally in 1999. He also said that other corps and division size Army

units may have similar training courses. In addition, the 82nd Airborne Division's Chemical Officer told us that, given the current emphasis on DU, the division is planning to incorporate DU training into its predeployment checklist of required items to accomplish before a unit deploys. This is being done as an additional assurance that deploying personnel will receive DU training, even if they miss it as part of common task training.

Air Force

The Air Force provided DU training as part of its nuclear radiation and hazardous materials training to bioenvironmental engineers and in the training curriculum for personnel with potential for exposure to DU as part of their military occupation (e.g., it has been provided for explosive ordnance personnel since before the Gulf War). In 1998, the Air Force began including DU training as a unit training requirement as part of its annual nuclear, biological, and chemical refresher training for all officer and enlisted personnel subject to deployment. In October 1999, DU training was added to Air Force basic recruit training. In addition, the Air Force Surgeon General made DU training a continuing medical education requirement by requiring that all Air Force medical personnel be trained annually in how to treat personnel wounded by DU munitions.

Navy

The only Navy weapons system that uses DU munitions is the Phalanx Close-in-Weapons System, a shipboard, rapid-firing 20 millimeter cannon designed to shoot down incoming missiles. The Navy is phasing out its use of DU rounds over the next 5 years because it has determined that the penetration capability of DU rounds is not necessary for shooting down missiles because they are lightly armored. Since the introduction of the Phalanx around 1980, the Navy has provided DU training to its fire control technicians who operate the system and who store and handle DU ammunition. Recognizing that other countries now have DU rounds and that its ships may be hit by DU rounds, the Navy made DU general awareness training a unit training requirement and a predeployment training requirement beginning in the fall of 1999 for all shipboard damage control personnel, firefighters, and medical personnel. In addition, explosive ordnance personnel, special operations personnel, and Seabees are now required to be provided DU training prior to each deployment or as part of annual refresher training. In addition to the general awareness training, deploying Navy medical personnel must also receive information on the treatment of personnel wounded by DU.

Marine Corps

The Marine Corps decided to wait until the Army had completed the DU training materials before providing DU training to its troops on a broad scale. In October 1998, the Marine Corps began providing DU training to personnel who have completed basic recruit training and are waiting to enter either the Marine Corps School of Infantry or a military occupational training program such as armor, ordnance, ammunition technician, or aircraft maintenance. In fiscal year 2000, Marine Corps officers are scheduled to begin receiving DU training as part of their entry-level officer training. DU training will also be introduced into advanced officer training courses and schools such as the Marine Corps War College, Marine Corps Commanders' Course, Marine Corps Command and Staff College, and the Amphibious Warfare School. Marine Corps noncommissioned officers will receive DU training in their noncommissioned officer courses, also beginning in fiscal year 2000. In addition, the Marine Corps plans to provide DU training to every Marine beginning in fiscal year 2000 by including DU training as one of its critical combat and survival skills, which are taught, tested, and periodically retrained in individual Marine Corps units (battalion level or below). Marine Corps units have a 2-year cycle for accomplishing this training. The Navy provides the Marine Corps with medical support; Navy medical personnel receive DU training as discussed earlier in the section on Navy DU training efforts.

Army's Implementation of Common Task Test—Depleted Uranium Training Requirement

This appendix presents in table 1 the results of our review of selected Army units' compliance with the Army's Common Task Test—Depleted Uranium Training for fiscal year 1999 at Fort Bragg, North Carolina, and Fort Knox, Kentucky.

Table 1: Number and Percentage of Unit Personnel Completing Army's Required Common Task Test–Depleted Uranium for Fiscal Year 1999 for Selected Army Units

Unit	Number in unit subject to Common Task Test	Number completing DU training	Percentage completing DU training
Fort Bragg			
A	133	109	82
B	122	111	91
C	69	56	81
D	176	175	99
E	10	7	70
F	108	65	60
G	82	37	45
H	101	74	73
I	99	95	96
J	59	44	75
K	79	55	70
L	89	78	88
M	100	0	0
N	104	95	91
O	89	0	0
P	89	70	79
Fort Knox			
A	132	0	0
Total	**1,641**	**1,071**	**65**

Source: GAO.

Comments From the Department of Defense

SPECIAL ASSISTANT
FOR
GULF WAR ILLNESSES

OFFICE OF THE SECRETARY OF DEFENSE
1000 DEFENSE PENTAGON
WASHINGTON, DC 20301-1000

Mr. Norman J. Rabkin
Director, National Security Preparedness Issues
National Security and International Affairs Division
General Accounting Office
Washington, D.C. 20548

10 MAY 2000

Dear Mr. Rabkin:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "GULF WAR ILLNESSES: Understanding of Health Effects from Depleted Uranium Evolving But Safety Training Needed," dated February 16, 2000 (GAO Code 703277/OSD Case 1947).

We are pleased that the GAO has based its medical findings on two recently published reviews of medical literature relating to depleted uranium by the RAND Corporation and the Agency for Toxic Substances and Disease Registry. The GAO has accurately reported the findings from these authoritative and exhaustive studies. Notwithstanding the ongoing work assessing dosages for those most exposed to depleted uranium, the GAO has correctly relied on the findings from the Baltimore VA DU follow-up program to be indicative of the medical effects expected in those most exposed to depleted uranium in the Gulf War. The Department initiated and continues to support this program and considers it the "gold standard" test of DU's effects on health.

In presenting the findings of the Baltimore VA's DU follow-up program, the GAO relied heavily on a peer reviewed scientific journal article by the program's lead doctor. Unfortunately, its quest for brevity, the GAO did not always present the key caveats that accompanied the report's findings. Nor did they indicate that the aberrant findings had only been observed in the follow-up participants with embedded (retained) depleted uranium fragments, as opposed to those with much smaller intakes from inhalation or ingestion. For example, the GAO reports in the "RESULTS IN BRIEF" section that "Some show lowered performance on computerized tests assessing problem-solving efficiency and some had higher levels of prolactin hormone associated with reproductive health." They caveated this with the sentence following this passage: "The clinical significance of these findings is currently unknown." In fact, the report published by the Baltimore doctors indicates that there was "no apparent clinical significance" to the prolactin levels, and that the principle caveat to the neurocognitive findings was that "the number of individuals with elevated uranium values was small and it appeared that a few veterans with complex histories may have contributed appreciably to the observed variance." While we can appreciate the need for brevity, we feel strongly that important caveats should never be divorced from medical findings. Without these caveats, some veterans may misinterpret these subtle perturbations to be clinically significant.

FEDERAL RECYCLING PROGRAM PRINTED ON RECYCLED PAPER

In a December 22, 1998 memorandum to the Secretaries of the Military Departments, the Deputy Secretary of Defense, Dr. John Hamre, directed the Services and Joint Staff to coordinate on a comprehensive Depleted Uranium (DU) training plan to ensure that each military member receives the training and information needed to respond safely and appropriately to battlefield DU contamination. As the plan's proponent, the Office of the Special Assistant for Gulf War Illnesses (OSAGWI) was tasked to provide periodic status reports on implementation to the appropriate authorities. Through a collaborative effort, the DU working group agreed on essential elements of information which would form the basis of each Service's DU training.

We appreciate the GAO's assistance in spot-checking compliance with the Department's training directive. While the limited scope of this evaluation precludes a Force-wide extrapolation of these results, it indicates that implementation continues to fall short of the Department's requirements and expectations. Therefore, the Department concurs with the recommendations. Based upon your draft report I took the following actions:

-- In my capacity as the Under Secretary of the Army, I wrote to the Vice Chief of Staff, Army, calling his attention to the GAO findings and to the deficiency they represent.

-- Additionally, in my capacity as a Special Assistant to the Deputy Secretary of Defense, I sent letters to the Chief of Staff, Air Force, Chief of Naval Operations, and Commandant of the Marine Corps, reiterating their responsibilities to ensure compliance with directives on DU training. I wrote the Director of the Joint Staff specifically addressing the issue of whether Kosovo-bound troops were trained. Deputy Secretary Hamre likewise will send a follow-up letter to the Service Secretaries and Chairman of the Joint Chiefs of Staff that emphasizes the importance of this training.

We will continue to work with the Services and the Joint Staff to identify, report, and remediate remaining barriers to full and successful DU awareness training.

Sincerely,

Bernard Rostker

Comments From the Department of Veterans Affairs

DEPARTMENT OF VETERANS AFFAIRS
WASHINGTON DC 20420

MAR 8 2000

Mr. Norman J. Rabkin
Director, National Security Preparedness Issues
National Security and International Affairs Division
U. S. General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Rabkin,

We have reviewed your draft report, ***GULF WAR ILLNESSES: Understanding of Health Effects from Depleted Uranium Evolving But Safety Training Needed*** (GAO/NSIAD-00-70). Under separate cover, we provided your staff with a few detailed comments for you to consider when preparing your final report. We appreciate your noting that the Department of Veterans Affairs is correcting each administrative problem that you identified during the course of your audit.

Thank you for the opportunity to comment on your draft report.

Sincerely,

Dennis Duffy
Assistant Secretary for
Planning and Analysis

GAO Contacts and Staff Acknowledgments

GAO Contacts

Christine A. Fossett (202) 512-2956

Acknowledgments

In addition to the name above, Derek Stewart, Steve Fox, Leo Jessup, Lynn Johnson, William Mathers, and Jack Edwards made key contributions to this report.

Ordering Information

The first copy of each GAO report is free. Additional copies of reports are $2 each. A check or money order should be made out to the Superintendent of Documents. VISA and MasterCard credit cards are accepted, also.

Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:
U.S. General Accounting Office
P.O. Box 37050
Washington, DC 20013

Orders by visiting:
Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders by phone:
(202) 512-6000
fax: (202) 512-6061
TDD (202) 512-2537

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

Orders by Internet:
For information on how to access GAO reports on the Internet, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web home page at:

http://www.gao.gov

To Report Fraud, Waste, or Abuse in Federal Programs

Contact one:

- Web site: http://www.gao.gov/fraudnet/fraudnet.htm
- e-mail: fraudnet@gao.gov
- 1-800-424-5454 (automated answering system)

PRINTED ON RECYCLED PAPER