

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
Robert C. Pierson, Acting Director

In the Matter of)	
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Department of the Army)	Docket No. 040-06394
)	License No. SMB-141
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)	Docket No. 040-07086
)	License No. SUB-734
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)	Docket No. 040-08814
)	License No. SMB-1411
)	
)	Docket No. 040-08838
)	License No. SUB-1435
)	
)	Docket No. 040-07354
)	License No. SUB-834
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)	Docket No. 040-08779
)	License No. SUC-1391
)	
)	Docket No. 040-08767
)	License No. SUC-1380
)	
ATK Tactical Systems Company, LLC)	Docket No. 040-08850
)	License No. SUB-1440
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Department of the Navy)	Docket No. 030-29462
)	License No. 45-23645-01NA
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Department of the Air Force)	Docket No. 030-28641
)	License No. 42-23539-01AF
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)	(10 CFR 2.206)

I. Introduction

U.S. Nuclear Regulatory Commission (NRC) provides members of the public with the means to request the Commission to take enforcement-related action to modify, suspend, or revoke a license, or to request other appropriate enforcement-related action, as may be proper. This policy is codified at Section 2.206 of Title 10 of the *Code of Federal Regulations* (10 CFR 2.206). The Commission may grant a request for action, in whole or in part, take other action that satisfies the concerns raised by the requester, or deny the request. The NRC reviews requests that raise health and safety and other concerns without requesting enforcement-related action by means other than the 10 CFR 2.206 process.

By electronic mail dated April 3, 2005, as supplemented on April 26, 2005, and May 4, 2005, James Salsman (Petitioner) filed a petition, pursuant to 10 CFR 2.206, requesting that NRC take “. . . immediate action to correct the alleged misconduct on the part of uranium munition licensees, for the protection of the health and safety of people, including United States citizens and personnel, and the environment.” The Petitioner states the basis for the requests is “. . . gross negligence on the part of the licensees that involved exceptionally grave issues and significant safety and environmental issues” and other serious misconduct, including fraud and willful wrongdoing, involving the hazardous nature of hexavalent uranium trioxide (UO₃). The requests in the petition that involve enforcement-related corrective actions, under NRC jurisdiction, are summarized as follows:

1. Require the licensees referenced in the petition, to document when and where significant quantities of hexavalent uranium have been ingested, inhaled, or released to the environment, and that each incident be recognized as a Severity Level I violation;
2. Find the licensees referenced in the petition, willfully negligent for their multiple Severity Level I violations because these licensees never detected hexavalent uranium, never attempted to detect it, and never recognized its hazards as a product of combustion of depleted uranium (DU) munitions;
3. Find that, had the Commission known the true risk of pyrophoric uranium munitions, the Commission likely would not have issued the existing licenses without substantial and restrictive modification, if at all;
4. Find 1) that a licensee officer's incorrect statement, on January 27, 2005, in asserting that “. . . scientific consensus is that remediation of sites where DU munitions were used is generally unnecessary,” was self-serving and was made to intentionally and fraudulently mislead licensees; and 2) that the assertion involved willful misconduct in misrepresenting the safety of hazardous licensed material contamination. Order the licensee to: 1) publish a correction to its officer's false, willful, and fraudulent assertion of the statement; 2) modify licenses to prohibit licensees from making any willful, false, or fraudulent statements; and 3) impose a \$100,000 per day fine for any delay in compliance;
5. Find that the licensee's submission of invalid studies, provided in response to the Commission's queries regarding D. Rokke's 10 CFR 2.206 petition in October and November 2000, requires corrective action and corrective modification to licenses; and

similarly, find that the continued willful publication of invalid statements and assertions concerning the safety of pyrophoric uranium munitions requires corrective modification to licenses, to require production of accurate valid studies of the safety of pyrophoric uranium, and publication of these studies; impose a \$100,000 per-day fine for any delay; and suspend or revoke licenses in cases of delay in compliance;

6. Order licensees to accurately determine the risk to health and safety of any and all known forms of inhalation and ingestion exposure to pyrophoric uranium munition combustion products, and risks associated with hexavalent uranium into the environment, risk ratios and their confidence intervals, under several sets of circumstances, modify their licenses based on this information, and impose a \$100,000 per-day fine for any delays in complying with the order;
7. Order licensees to: 1) determine the best safe and effective medical therapies for uranium poison victims; 2) determine the best remediation of sites where munitions were burned or combustion products reached groundwater, plant or animal life, and mitigate and remediate these sites; 3) modify their licenses, based on this information; and 4) impose a \$100,000 per day fine for any delays in complying with the order;
8. Assess each incident of gross conduct, each incident of willful misconduct, and each identified fraudulent assertion concerning the safety of DU munitions or related contamination at a Severity Level I; fine the munition licensees \$100,000 for each of these identified incidents of all Severity Level I violations; and suspend the licenses immediately until corrective actions for these violations are completed.

Also, in the May 4, 2005, supplement to the petition, the Petitioner indicated that the quantities in Appendix B to 10 CFR Part 20 for allowable intakes of uranium were designed to address only the radiological hazard of uranium, and not the heavy-metal toxicity, and that soluble compounds are far more toxic than the insoluble compounds. Since the Petitioner questions the adequacy of 10 CFR Part 20 and has made a separate request for rulemaking to amend Part 20, this part of the will be addressed along with the petition for rulemaking. A notice of receipt of a petition for rulemaking from the Petitioner was published in the *Federal Register* on June 15, 2005 (70 FR 34699).

The petition may be viewed in the NRC Agencywide Document and Management System (ADAMS), Public Library component, on NRC's web site, <http://www.nrc.gov> (the Public Reading Room), under accession number ML051240497.

The Petitioner met with the Nuclear Material Safety and Safeguards (NMSS) Petition Review Board via a teleconference on May 4, 2005, to discuss the petition. The transcript of this meeting was treated as a supplement to the petition, and is available in ADAMS at the Commission's Public Document Room, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, and from NRC's ADAMS web site, under accession number ML051390187.

In a letter dated May 26, 2005, NRC informed the Petitioner that the request for immediate modification of the licenses referenced in the petition was denied because there was no apparent immediate threat to public health and safety from continued operations under the

current DU munitions licenses, and that the petition was being referred to NMSS for appropriate action.

NRC sent a copy of the proposed Director's Decision to the Petitioner and to the affected licensees, for comment, on September 23, 2005. The Petitioner responded by e-mail with comments on October 19, 2005, (ML053210302) and the licensees responded on October 12, 2005 (Army) (ML053210300), and October 17, 2005 (Air Force) (ML053210305). The comments and the NRC staff's response to them are included in this final Director's Decision.

II. Discussion

A. DU Munition Licenses

DU is a byproduct of the uranium fuel-enrichment process, having a higher percentage of uranium-238 and lower percentage (depletion) of uranium-235 than natural uranium. DU is used, among other things, in military munitions. Because of its high density and pyrophoric characteristics, it is more efficient in penetrating hard targets than conventional projectiles.

NRC has granted licenses authorizing the possession of DU for the purpose of using it in munitions to: 1) the U.S. Department of the Army (U.S. Army); 2) the U.S. Department of the Navy (U.S. Navy); 3) the U.S. Department of the Air Force (U.S. Air Force); and 4) a civilian manufacturing firm. The U.S. Army possesses individual licenses for seven sites. The U.S. Navy and U.S. Air Force both have a master materials license that includes authorization for DU munitions. The civilian organization has a single DU munitions license. Half the Army licenses do not authorize the firing of ammunition containing DU material. These licenses are for possessing, storing, transporting, and transferring DU munitions, or for use of DU in activities other than actively firing the munitions (such as manufacturing or deactivating the munition, or possession incident to the decommissioning of a site). Several of the remaining licenses give authority to test-fire DU munitions, but only in an enclosed environment (i.e., a building where the munition impacts its target in an environmentally closed system). Firing the DU munitions in an enclosed environment minimizes the impact of pyrophoric characteristics, radiologic hazard, and chemical toxicity to personnel and the environment.

B. Jurisdictional Limitations

The Petitioner requests remediation and mitigation of conditions resulting from licensed activities and from warfare use of DU munitions. The U.S. Army, U. S. Navy, and the U.S. Air Force are permitted by their licenses to test-fire DU munitions. NRC licenses do not, however, address the warfare use of DU munitions, since NRC has no statutory authority to regulate such use. Accordingly, the Petitioner's request for NRC action regarding the warfare use of DU munitions is denied. With respect to Petitioner's request for remediation and mitigation of conditions resulting from test-firing of DU munitions pursuant to NRC licenses, the Petitioner's request is considered here, in so far as NRC regulates the decontamination and decommissioning of nuclear facilities, with the ultimate goal of license termination and release of a site for unrestricted use. (See Subpart E of 10 CFR Part 20, and 10 CFR 40.42.)

C. Regulatory Limits for Uranium

The radioactive material concentration levels, contained in the tables of Appendix B to Part 20 regulations, are based on the recommendations of the International Commission on Radiological Protection (ICRP), and the U.S. counterpart to the ICRP, the National Council on Radiation Protection and Measurements (NCRP). The annual limits on intake (ALI) of a given radionuclide are levels of intake, within a year, that would result in either a committed effective dose equivalent of 0.05 sieverts (5 rem) or a committed dose equivalent of 0.5 sieverts (50 rem) to an organ or tissue. These quantities are based on the dose an individual would receive, from the radionuclide listed, once the radionuclide enters the body. For inhaled radionuclides, the different clearance rates from the lung to the blood or to the gastrointestinal tract depend on the chemical form of the radionuclide, and are classified as D, W, and Y, for clearance times of days, weeks, and years. The level listed for a given ALI pertains to the total quantity of the radionuclide, regardless of its original chemical composition in a clearance class when it enters the body.

For uranium, the chemical toxicity may be the limiting factor for intake. The value for the uranium air concentrations in footnote 3 in Appendix B to Part 20 is based on the recommendations of the American Conference of Government Industrial Hygienists (ACGIH). The ACGIH is an organization devoted to the administrative and technical aspects of occupational and environmental health. It is a professional society and not a government agency. The Occupational Safety and Health Administration (OSHA) pointed out, in 54FR2332 (January 19, 1989), that the ACGIH is an organization of experts who are knowledgeable about the American workplace and the health literature. OSHA also noted that the ACGIH permits outside participation in development of exposure limits and solicits comment on proposed recommendations. OSHA relies on ACGIH research and recommendations to facilitate its rulemaking on limits for various substances.

From the 2001 ACGIH World-Wide "Documentations of the Threshold Limit Value and Biological Exposure Indices (Seventh Edition-2001)," a Threshold Limit Value (TLV) refers to airborne concentration of a substance and represents conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. TVLs are based on available information from industrial experience, experimental human and animal studies, or a combination of all three, when possible.

Currently, the ACGIH has assigned 0.2 milligrams per cubic meter, as a TLV-Time Weighted Average (time-weighted average concentration for a conventional 8-hour workday and a 40-hour work week), for soluble and insoluble natural uranium. This level appears in Footnote 3 in Appendix B to Part 20, which states that chemical toxicity may be the limiting factor for soluble mixtures of uranium-238, uranium-234, and uranium-235 in air. The uranium air concentration limit for a 40-hour work week is stated as 0.2 milligrams per cubic meter of air average. Section 20.1201(e) of Part 20 contains the limit for chemical toxicity; it states that the soluble uranium intake limit is 10 milligrams per week. This quantity is derived by multiplying the 0.2 milligrams per cubic meter air concentration level by the amount of air an individual breathes in 40 hours. Natural uranium and DU are chemically the same.

D. Petitioner's Bases

The Petitioner based his request for corrective action on “. . . gross negligence and other serious misconduct including fraud, willful wrongdoing, and a serious breach of the public trust on the part of uranium munitions licensees and their officers, employees, contractors, and agents.” He asserts that significant quantities of hexavalent UO_3 are released in combustion of DU, that licensees never attempted to detect it, even though they knew, or should have known, and that it was both hazardous and a product of uranium combustion.

The Petitioner indicated that the experiments, conducted and reported by researchers performing work for the Army concerning DU aerosol generation during use of DU munitions, failed to find or report an expected chemical state of uranium in the form of hexavalent uranium, particularly UO_3 . The Petitioner stated that “. . . the uranium munitions licensees were never able to detect, and have never been able to detect monomolecular UO_3 .” The Petitioner cites numerous professional texts and journal articles to support his assertion that hexavalent uranium should be present after the use or testing of DU munitions, and that UO_3 is more similar to soluble uranyl salts than to the insoluble oxides. The Petitioner infers that rapid removal of UO_3 from the lung “. . . indicates that uranium trioxide is is (sic) as non-radiologically toxic as the most hazardous uranium compound,” and states “(T)he non-radiological heavy metal toxicity of uranium is a million-times worse than its radioactivity, with regard to certain aspects of biological poisoning, including genetic damage.”

The Petitioner states that the wrongdoing entails licensees making intentional false statements to misrepresent the hazardous nature of licensed material and activities. The Petitioner considers the failure to report in the license application the presence of hexavalent UO_3 , a false statement upon which NRC relied in granting the license for the possession and use of DU munitions. The Petitioner further asserts that grant of the license failed to protect public health and safety.

Also, in a meeting with the Petition Review Board on May 4, 2005, the Petitioner indicated that the Army submitted a list of studies and reports to NRC, in response to a June 2000 petition concerning DU munitions. The Petitioner indicates that two studies, one from 1979 and one from 1995, were submitted as authoritative and accurate regarding aspects of combustion products caused by the firing of DU munitions. The Petitioner asserts that the information submitted by the Army in response to the June 2000 petition, and particularly these two reported studies, is inaccurate, because the studies did not find nor indicate the presence of UO_3 as a product of DU munitions firing.

E. Licensees' Responses to the Petition

On June 10, 2005, NRC notified affected licensees that a 10 CFR 2.206 petition had been submitted that involved their licenses. The correspondence also informed these licensees that they could respond to the petition if they desired. NRC received three letters in response to this notification.

The U.S. Air Force's response (ADAMS Accession Number ML052270194) to the petition indicates that it has no data to support the contention that uranyl nitrate or UO_3 is a significant combustion product. The Air Force refers to Army research on DU munitions testing that does

not indicate uranyl nitrate or UO_3 to be a significant combustion product when DU munitions have been fired. The Air Force attached a copy of a recent article from the Health Physics Journal to its response letter, which indicates that components of samples of dust resulting from DU munitions live fire consisted of the uranium oxides U_3O_7 , U_3O_8 , and UO_2 . The Air Force also indicates that it is in full compliance with its Master Material License and with all applicable NRC regulations, and that its use of DU munitions does not pose any significant exposure hazard to either its employees or members of the general public.

The U. S. Navy, in its response (ADAMS Accession Number ML052270196), indicates that, before and after its use of DU munitions, health and environmental aspects were carefully considered. Its involvement in studies extends beyond the Navy to efforts involving the Department of Veteran Affairs and the Armed Forces Radiobiological Research Institute. The Navy's response references the 33 soldiers exposed to DU in the Gulf Wars as a result of friendly fire, and the results of follow-up studies of these soldiers, which are consistent with the initial estimate of no significant health effects. The Navy also mentions studies by international organizations on the environmental impacts in Kosovo, Bosnia, and Iraq and the Gulf War, noting that these studies indicate that no widespread contamination and no current impact on the health of the general public nor deployed personnel have been attributed to the use of DU munitions. The Navy states that the documentation submitted or referenced by the Petitioner fails to add information to what has already been published to date, that the allegations are based on the Petitioner's assumptions about chemical reactivity, and that putative resultant chemical components will cause undocumented human harm. Because of the speculative nature of the Petitioner's allegations and the lack of empirical data to support them, the Navy does not believe this petition raises safety concerns not previously addressed.

The U.S. Army addresses several issues in its response (ADAMS Accession Number ML052380089). The response cites the studies on human health effects of Gulf War Veterans with imbedded DU from friendly fire. The studies' assessments conclude that there are no health effects attributable to DU on the group other than increased uranium in urine. The Army also references an Agency for Toxic Substances and Disease Registry "Toxicology Profile for Uranium" (Update) 1999, which indicates it is doubtful that human exposure to uranium compounds at or near a hazardous waste site could result in interference with normal reproduction. The Army also cites "Capstone Aerosols Depleted Uranium Aerosol Doses and Risks: Summary of U.S. Assessments, October 2004," which indicates that recent studies could not determine if UO_3 were in aerosols of fired DU munitions because of overlapping X-ray diffraction patterns with U_3O_8 . In that case, results were reported as a single quantity " $\text{U}_3\text{O}_8/\text{UO}_3$." The Army response also addresses: 1) issues of cloud behavior of high concentration of aerosols; 2) the solubility of UO_3 ; 3) oxidation states of DU recovered in range and soil samples; 4) the Iraq cleanup of DU contaminated sites and equipment; 5) environmental monitoring at Army ranges; and 6) the impact of uranyl nitrate on workers exposed to DU. The letter also includes a March 10, 2005, Fact Sheet on the "U.S. Army Capstone Depleted Uranium Aerosol Study and Human Health Risk Assessment," and a list of study reports and publications.

F. NRC Evaluation of Petition Items

Petition Summary Item 1. The Petitioner requests that licensees document when and where significant quantities of hexavalent uranium have been ingested, inhaled, or released to the environment, and that each incident be recognized as a Severity Level I violation.

NRC already requires documentation and reporting of releases and exposure to radioactive substances. NRC regulations specifically establish exposure limits for uranium, including hexavalent UO_3 . See 10 CFR 20.1201(e), 10 CFR 20.1302(b), and Appendix B to Part 20. NRC requires monitoring of exposure of workers and members of the public to licensed material (Subpart F of Part 20). The regulations require the use of surveys, equipment, and instruments that are necessary to comply with the exposure limit regulations of Part 20. Subpart C of Part 20 addresses occupational work limits, whereas Subpart D addresses the radiation dose limits for individual members of the public. Subpart L contains requirements for documentation and recordkeeping of radiation protection programs, surveys, and records of exposure to occupational workers, as well as individual members of the public. Subpart M contains reporting requirements for notification of incidents and exposure, radiation levels, and concentrations of radioactive material exceeding the constraints or limits. To the extent that the Petitioner requests, in item 1, that licensees be subject to existing documentation requirements, the request is granted.

The request that NRC treat any releases of and exposures to UO_3 as violations is a challenge to exposure limits established by NRC regulations. Such a request is outside the scope of the 10 CFR 2.206 petition process and is not considered here. It is noted that, on May 6, 2005, the Petitioner filed a petition for rulemaking, requesting that NRC revise its Part 20 regulations, that specify limits for ingestion and inhalation occupational values, effluent concentrations, and releases to sewers, for all heavy-metal radionuclides (including UO_3) with non-radiological, chemical toxicity hazards exceeding their radiological hazards, so that those limits properly reflect the hazards associated with reproductive toxicity, danger to organs, and all other known non-radiological aspects of heavy metal toxicity. The Petitioner's concerns regarding the adequacy of these exposure values in NRC regulations are being addressed in that rulemaking process. See the *Federal Register* on June 15, 2005 (70 FR 34699).

The request that NRC classify all releases and exposures of UO_3 as Severity Level I violations is a challenge to the NRC Enforcement Policy. (See "NRC Enforcement Policy," at <http://www.nrc.gov/what-we-do/regulatory/enforcement/enforc-pol.pdf>.) The NRC Enforcement Policy articulates the process used to assign severity levels for violations of NRC requirements. For example, Severity Level I violations involve levels of radiation exposure many times the limits specified in Part 20. (See NRC Enforcement Policy, Supplement IV.) To the extent that the Petition challenges NRC policy regarding the dispositioning of violations involving exposures above regulatory limits and reporting of releases, the Petition fails to raise a concern properly subject to 10 CFR 2.206. Therefore, Request 1 to recognize each incident of ingestion, inhalation, or release of hexavalent uranium to the environment as a Severity Level I violation, is denied.

Petition Summary Item 2. The Petitioner requests that the Commission find the licensees referred to in the petition, individually and jointly, willfully negligent for their multiple Severity Level I violations, because the licensees never detected hexavalent uranium or recognized its

danger, never attempted to detect it, and never recognized nor assumed it was both hazardous and a product of combustion of DU munitions.

The Petitioner notes that two DU aerosol studies, performed by or for DU munition licensees, did not find UO_3 when DU munitions were fired or subject to high-temperature fires. The Petitioner cites journal and text book references that argue that UO_3 should be present in these cases, and that hexavalent uranium is of very serious importance in evaluating the safety of a uranium fire.

The Petitioner cites a November 1979 report entitled "Characterization of Airborne Uranium from Test Firings of XM774 Ammunition," PNL-2944, as having no indication of the detection of UO_3 . A licensee had listed the report in its response to a June 2000 Section 2.206 petition. On page 49, the 1979 report indicates that uranium at elevated temperatures can ignite and oxidize rapidly, and "(F)our oxides have been established-- UO_2 , U_4O_9 , U_3O_8 , and UO_3 — . . ." The report describes the difficulty in certifying the presence or quantifying the amount of UO_3 , because of the problem of overlap of x-ray diffraction profiles from U_3O_8 and UO_3 creating uncertainty in the evaluation of UO_3 . The data in the report indicate the presence of U_3O_8 and UO_2 , in the ratio of 75 percent to 25 percent, respectively.

That the licensees have not detected hexavalent UO_3 , nor recognized the hazard from hexavalent UO_3 in licensed activities, claimed by the Petitioner, is not a violation of any NRC requirement. In addition, the Petitioner provides no basis for his assertion that the licensees, individually or jointly, were willfully negligent in this regard. Accordingly, Request 2 is denied.

Petition Summary Item 3. The Petitioner requests the Commission find that, had the Commission known the true risk of pyrophoric uranium munitions, the Commission likely would not have issued the existing licenses without substantial and restrictive modification, if at all.

The Commission uses the recommendations of the ICRP and NCRP for the radiological bases of NRC regulations. These two scientific bodies collect, review, analyze, and develop information about protection against radiation, and have established levels to provide safety and prevent detrimental effects from exposure to radiation sources. The Commission, recognizing that the chemical toxicity of uranium may be more limiting than levels associated with radiological limits, has used the AGCIH recommendation as an additional limit to the annual radiation dose limit.

The inherent risk or hazard of a material is not the sole basis for decisions to grant a license or authorize its use. The license applicant must demonstrate that it can safely possess and use the authorized material while protecting public health and safety, and the environment, through acceptable design, procedure, construction, operation, maintenance, and quality assurance measures. At the time of a licensing review, the Commission considers the known hazards of the material being requested, and considers the current regulatory requirements. The review of a license application includes the overall ability of the licensee to meet all regulatory requirements and maintain public health and safety and protect the environment.

NRC licenses that authorize test-firing DU munitions contain certain restrictions and conditions, such as limited firing positions and locations, limiting test-firing to an enclosed environment, and implementation of monitoring programs. The restrictions control releases of material generated

by test firing. The monitoring programs verify the concentration levels of the facility's restricted and unrestricted areas, to ensure that exposures to those engaged in licensed activities and to members of the public, if they occur, are within allowable limits.

For radiological considerations, radionuclides have three different inhalation intake and air concentration allowable levels, based on the chemical form of the compound. These different classification levels reflect the retention time in the pulmonary region of the lung. This classification applies to a range of clearance half-times of less than 10 days for D, 10 to 100 days for W, and greater than 100 days for Y. UO_3 is classified in Part 20 as having a clearance class of W, whereas U_3O_8 has a clearance class of Y. For uranium-238, the predominant radionuclide in DU munitions, the Y class has more restrictive (smaller) allowable intake and concentration levels than the W class. Licensees that encounter both UO_3 and U_3O_8 in aerosols would classify the aerosols proportionately as class W and class Y, respectively, or, if the relative concentrations were not known, as all class Y, the most restrictive level, and would be in compliance when UO_3 is present, regardless of its relative concentration in the aerosol.

Moreover, with regard to chemical toxicity, NRC regulations limit the intake by an individual of any soluble uranium to 10 milligrams in a week, which is based on the ACGIH TVL of 0.2 milligrams uranium per cubic meter of air. ACGIH determined this level based on the impact to the most sensitive organ to uranium toxicity in humans and animal, the kidney.

Based on a review of scientific literature by the Petitioner, and scientific and technical information otherwise available, NRC staff is unable to conclude that the presence of UO_3 during test firing of DU munitions represents a safety hazard greater or different than recognized when the DU munitions licenses were granted. That hazard is addressed by both the terms and conditions of the DU munitions licenses and by NRC regulations regarding dose limits and reporting exposures, radiation levels, and concentrations of radioactive material. NRC DU munition licensees have not reported any incidents exceeding these limits in the activities relating to the testing of DU munitions, nor has NRC found any incidents of regulatory limits being exceeded in activities related to DU munitions.

The Petitioner has supplied no information that could provide a basis to conclude that licensed activities may have involved any violation of NRC requirements, or that the presence of UO_3 during test firing of DU munitions represents a safety hazard greater or different than that recognized when the DU munitions licenses were granted. During review of DU munition license applications, the Commission considered the hazards and the applicable regulatory requirements, including requirements for acceptable design, procedures, construction, operation, maintenance, and quality assurance measures. Licenses were granted after NRC staff determined that the authorized use would meet all NRC requirements. Accordingly, Request 3 is denied.

As indicated above, the Petitioner also submitted a petition for rulemaking on May 6, 2005, docketed by NRC on May 13, 2005, which requests that NRC amend 10 CFR Part 20 to modify exposure and environmental limits of heavy metals (Docket No. PRM-20-26). NRC will consider and address the safety hazard of UO_3 in this rulemaking proceeding.

Petition Summary Item 4. The Petitioner asserts that a licensee's statement, on January 27, 2005, that ". . . scientific consensus is that remediation of sites where DU munitions were used is generally unnecessary . . .," intentionally and fraudulently

misrepresented the safety of the hazardous licensed material contamination during the time of deliberations, concerning actions required at the Jefferson Proving Ground and other contaminated sites, in violation of NRC requirements.

Petitioner claims that wrongdoing occurred when General Richard Myers, Chairman of the United States Joint Chiefs of Staff, made a false statement, on January 27, 2005, in a letter to a non-NRC individual, that the scientific consensus is that remediation of sites where DU munitions are used is generally unnecessary. For a licensee statement to be treated as a false or inaccurate statement subject to NRC enforcement [i.e., a violation of Section 186 of the Atomic Energy Act, of 10 CFR 40.9(a), the rule on completeness and accuracy; or of 10 CFR 40.10(a)(2), the deliberate misconduct rule], the statement must be made to NRC, and it must be material to NRC. However, the alleged statement was made to a third party and not to NRC. Even if the statement had been made to NRC, it would not be a violation of NRC requirements because it is not material. Because the alleged false statement is a mere opinion about a scientific consensus, it is not capable of influencing any NRC decision as to whether remediation of sites where DU munitions are used is necessary to protect public health and safety. Accordingly, NRC finds that the alleged statements do not violate any NRC requirement, and Request 4 is denied.

Petition Summary Item 5. The Petitioner requests that NRC find the licensee's submission of studies, provided in response to NRC queries regarding D. Rokke's 10 CFR 2.206 petition in October and November 2000, to be "invalid," and that NRC require corrective action and corrective modification to licenses. Similarly, the Petitioner requests that the Commission find that the continued willful publication of invalid statements and assertions concerning the safe use of pyrophoric uranium munitions requires corrective modification of DU munition licenses to require the DU munition licensees to produce accurate, valid studies of the safety of pyrophoric uranium, and to publish these studies. The Petitioner requests that a \$100,000 per-day fine should be imposed for any delay in making and publishing said studies, and that NRC suspend or revoke the licenses of those licensees that delay compliance.

The studies to which the Petitioner refers are those that the Army submitted as authoritative, in June 2000, in response to a 10 CFR 2.206 petition. At the May 4, 2005, Petition Review Board meeting, the Petitioner referenced a 1979 research paper entitled *Characterization of Airborne Uranium from Test Firings of XM774 Ammunition*, PNL-2944, and a 1995 publication entitled *Evaluation of Depleted Uranium Aerosol Data: Its Adequacy for Inhalation Modeling*, PNL-10903. The Petitioner asserts that the Army used the test information to claim that there were no serious health and environmental consequences from DU munitions test firing. The Petitioner considers the report invalid because he asserts that, through interpretation of other references, UO_3 should have been present. On page 49, the 1979 report indicates that uranium at elevated temperatures can ignite and oxidize rapidly, and four oxides have been established [i.e., UO_2 , U_4O_9 , U_3O_8 , and UO_3]. The report's findings, however, were that the aerosolized sample collected indicated 75 percent U_3O_8 and 25 percent UO_2 , analyzed for relative abundance, semi-quantitatively, by X-ray diffraction analysis. No UO_3 was identified in the analysis. The 1995 publication abstract indicated that more than 20 of Battelle's studies and 20 more studies conducted by other researchers were reviewed. Although the researchers cited several areas as needing further research (e.g., resuspension and particle-size distribution), the researchers deemed the overall quality of the data, from the reviewed reports,

adequate to conservatively estimate dispersion and health effects. The two studies were among numerous studies in a list enclosed with the Army's response to a 10 CFR 2.206 petition submitted in June 2000. The list was prefaced with encouragement to review the studies listed, along with other documents that could be viewed on certain websites.

Some DU munition licensees have been producing tests and studies (some performed by the licensees and others performed for the licensee by outside researchers) starting in the 1970s. Publications have been documented and/or published by government and non-government agencies, both internal and external to the licensees, by institutes and academies, by advisory committees, and by specially appointed boards. A recent Army-sponsored endeavor (along with the Department of Defense) was the Capstone Aerosols "Depleted Uranium Aerosol Doses and Risks: Summary of U.S. Assessments, October 2004," which can be viewed at http://deploymentlink.osd.mil/du_library/du_capstone/index.pdf.

To the extent this request intends to assert that submission of the allegedly invalid studies constitutes a violation of NRC requirements concerning the completeness and accuracy of information, the request is denied. The studies' conclusions constitute technical judgments or statements of opinion on a scientific matter, and are not subject to NRC requirements on completeness and accuracy of information. Mere disagreement with scientific conclusions or technical judgments of the studies in question does not render them violations of NRC requirements on completeness and accuracy of information. The Petitioner has identified no violation of NRC requirements concerning completeness and accuracy of information, nor any deliberate misconduct. Therefore, Request 5 is denied.

To the extent this request is based on an assertion that licensed activities involving firing of DU munitions creates hazardous levels of UO_3 not previously recognized by NRC, this issue is addressed in the Petition Summary Item 3 above. As to the levels of UO_3 allowable, that issue is being address in the Petitioner's petition for rulemaking. [See the *Federal Register* on June 15, 2005 (70 FR 34699)].

Petition Summary Item 6. The Petition requests that the Commission modify all DU munition licenses, to require licensees to accurately account for the risk, to health and safety, of any and all known forms of inhalation and ingestion exposure to pyrophoric uranium munition combustion products, and risks associated with hexavalent uranium release into the environment, risk ratios and their confidence intervals, under several sets of circumstances. It also requests that there be a fine of \$100,000 per day for any delays in complying with the order.

NRC generally follows the basic radiation protection recommendations of the ICRP, and its U.S. counterpart, the NCRP, in formulating basic radiation protection standards. There are also scientific bodies that analyze data on sources and effects of radiation, and publish series of reports containing summaries of sources of radiation, and doses received by workers and members of the public. Reports of the United Nations Scientific Committee on the Effects of Atomic Radiation and the National Academy of Sciences' Committee on the Biological Effects of Ionizing Radiation describe the potential health risks from these exposures. As stated above, in the case of uranium, NRC has used a chemical toxicity limit established by the ACGIH and endorsed by OSHA. NRC uses information concerning risk and impact on health from established scientific bodies dedicated to this subject.

NRC regulations impose dose limits based on generally accepted radiological risk analyses performed by the ICRP, and NCRP, and in the case of chemical toxicity of uranium, the ACGIH. The Petitioner's request is a challenge to NRC regulations that is not provided for under the 10 CFR 2.206 process. We note that the Petitioner filed a petition for rulemaking pursuant to 10 CFR 2.802 on May 6, 2005, requesting that NRC amend its regulations to modify the exposure and environmental limits of heavy metal radionuclides, including UO₃. The Petitioner's concern regarding NRC dose limits for UO₃ will be addressed in the rulemaking. Therefore, Request 6 is denied.

Petition Summary Item 7. The Petitioner requests the Commission to order licensees to determine the best, safest, and most effective medical therapies for uranium poison victims, and the best remediation of sites where munitions were burned or combustion products reached groundwater, plant, or animal life; to modify their licenses to include this information; to mitigate and remediate these sites; and to impose a \$100,000 per day fine for any delays in complying with the order.

The request to require licensees to determine the best, safest, and most effective medical therapies for uranium poisoning is outside the scope of NRC jurisdiction. NRC has no authority to require medical treatment of any human malady, or to determine the best method of treatment.

NRC regulates the decontamination and decommissioning of nuclear facilities with the ultimate goal of license termination and release of a site for unrestricted use, including DU munition facilities. (See 10 CFR Part 20, Subpart E, and 10 CFR 40.42.) One uranium munition licensee was released recently from a program providing special attention and oversight to decommissioning activities (Aberdeen Proving Ground, 1996), and one is currently in this decommissioning oversight program (Jefferson Proving Ground).

The Petitioner has identified no violations of NRC requirements concerning decontamination or decommissioning. To the extent Petitioner seeks remediation requirements that go beyond NRC requirements, the request does not constitute a request for enforcement action of current NRC requirements. Accordingly, for all the above reasons responding to this item, Request 7 is denied.

Petition Summary Item 8. The Petitioner requests that the Commission fine DU munition licensees \$100,000 for each identified incident of all Severity Level I violations, each incident of gross negligence, each incident of willful misconduct, and each identified fraudulent assertion concerning the safety of DU munitions or related contamination, and suspend the DU licenses immediately until corrective actions for the above are completed.

The staff has identified no violations of NRC requirements. Accordingly, Request 8 is denied.

Petitioner and Licensees Comments on the Proposed Director's Decision

Comments on the proposed Director's Decision were received from the Petitioner and two licensees. The Petitioner's comments were received by e-mail on October 19, 2005. The Army e-mailed its comments on October 12, 2005, and the Air Force comments are dated October 17, 2005.

Both licensees' comments indicated agreement with the decisions made in the proposed Director's Decision. Comments from the Petitioner contained four proposed amendments to the original petition, and seven additional questions, all of which are addressed below.

The first two Petitioner amendments request that DU munitions licenses be modified to require the licensees to quantify information such as date, time, location, etc., and specifically to determine the amount of uranyl oxide gas produced during the use of pyrophoric uranium munitions. The third amendment requests modification of the licenses to require licensees to determine the extent of both reproductive and developmental toxicity of typical uranium combustion product inhalation on several diverse animal species. The last amendment requests that the licenses be modified to require the licensees to publish the estimates and determinations from the previous three amendments just listed above.

Title 10 Part 20, Subpart L (Records), and Subpart M (Reports) already require documentation, when appropriate, of estimated intakes of radionuclides, the dose assigned to an intake of radionuclides, and the dose to the organ receiving the highest total dose, among other information necessary to determine compliance with the safety requirements of 10 CFR Part 20. In addition, reports must be made to NRC of exposures exceeding the allowable limits. The Petitioner has not identified any violation of these requirements. Current regulations do not require licensees to quantify the dates, times, locations, quantities, and types of DU munitions used. The Petitioner's requests to require such documentation are in effect a challenge to NRC regulations, and are, therefore, outside the scope of the Section 2.206 process. Nonetheless, licensees have recorded data associated with test-firing of DU munitions, beginning in the 1970s, acknowledged by the Petitioner, to the present, and most recently in the October 2004 Capstone Report. (http://deploymentlink.osd.mil/du_library/du_capstone/index.pdf)

The third amendment requested licensees to determine the extent of both reproductive and developmental toxicity from typical uranium combustion product inhalation on diverse species of animals, and the fourth amendment requested requiring the licensees to publish the findings of these independent determinations. These requests are not for enforcement-related actions, and there is no NRC requirement to perform such studies. Petitioner's third and fourth amendment requests are in essence challenges to NRC regulations, and therefore, outside the scope of the Section 2.206 process.

The Petitioner has also posed seven questions. The first two questions inquire about the documentation required of licensees. The next three questions pertain to UO_3 , as it relates to the lung clearance time, and its physical characteristics of being a vapor. The sixth question asks if the armed forces were aware of monomolecular gaseous UO_3 vapor, and the last question asks why NRC may not require a licensee to require medical treatment to remedy an accidental safety violation.

The first two questions posed in the Petitioner's comments to the proposed Director's Decision raise the same issues as raised by the first two amendment requests and by Request 1, and have been addressed above.

Questions three through five ask whether the clearance time of small particles of UO_3 is less than 10 days, whether UO_3 is a lung clearance class of D (days) or W (weeks), and whether UO_3 is produced in a gas vapor during uranium munition combustion. Questions three through

five articulate at least a portion of the Petitioner's technical basis for his petition for rulemaking, and, therefore, are outside the scope of the Section 2.206 process. These issues will be addressed along with the Petitioner's request for rulemaking already before the NRC.

Question six poses the question of whether the armed forces were aware that uranium-oxygen combustion produces monomolecular gaseous UO_3 gas vapor, before the Petitioner brought the issue to their attention in the petition. As stated in Petition Summary Item 2, a 1979 Pacific Northwest Laboratories test report indicates that UO_3 was established as one of the possible oxides resulting from uranium combustion at elevated temperatures. The statement that no UO_3 was in fact found is factually accurate, and, therefore, cannot constitute a violation of NRC requirements concerning completeness and accuracy of information. Also the Capstone Report, mentioned above, indicates that because of the difficulty of distinguishing x-ray diffraction lines of U_3O_8 and UO_3 , the report provides data in the form of total $\text{U}_3\text{O}_8/\text{UO}_3$ quantities.

Question seven asked why NRC may not modify a license to require medical treatment for individuals harmed by licensed activity. NRC's authority to regulate the use of radioactive material is derived from the Atomic Energy Act (AEA) of 1954, as amended. The AEA defines the scope of the agency's mission and grants various powers to carry out that mission. In our system of government, regulatory powers are those that are granted, not those that have not been prohibited.

III. Conclusions

The Petitioner has introduced concerns about chemical components generated during the use of DU munitions subject to high temperatures, and has reached conclusions based on his assessment and interpretation of available scientific data. The Petitioner suggests that the hazard from the chemical toxicity of DU munition firing is greater than has been understood, and that DU munition licensees expose the public to risks that are not adequately addressed in current NRC regulations. The Petitioner also considers the amount of information available on the effects of uranium on the human reproductive system to be inadequate.

NRC staff has considered this information, along with the Petitioner's requests, and has determined that several of the issues raised by the Petitioner do not fall under the enforcement-related corrective action provisions of the 10 CFR 2.206 process. For those issues that do fall under the enforcement-related corrective action provisions of 10 CFR 2.206, the Petitioner has not shown that DU munition licensees have willfully or negligently ignored relevant studies addressing the use of DU munitions, or that the licensees have created a condition hazardous to public health and safety. Nor has the Petitioner identified any violation of NRC requirements by DU munition licensees. The issue of the adequacy of NRC regulations addressing the hazards of hexavalent uranium is being addressed in the petition for rulemaking process.

Therefore, the NMSS Director has determined that the Petitioner's requests for licensees to report incidents and over-exposures to NRC, and to remediate their facilities in accordance with current regulations, have been, in effect, granted. The NMSS Director has also determined that Petitioner's requests for modification and/or revocation of DU munition licenses, and for the imposition of fines, are denied.

As provided in 10 CFR 2.206(c), a copy of this Director's Decision will be filed with the Secretary of the Commission for the Commission to review. As provided for by this regulation, this decision will constitute the final action of the Commission 25 days after the date of the decision unless the Commission, on its own motion, institutes a review of this decision within that time.

Dated at Rockville, Maryland, this 30th day of December 2005.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert C. Pierson, Acting Director
Office of Nuclear Material Safety
and Safeguards

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Dated at Rockville, Maryland, this 30th day of December 2005.

FOR THE NUCLEAR REGULATORY COMMISSION

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Robert C. Pierson, Acting Director
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