

Physical Security Plan for US Army Installation Management Command Ranges Affected by Depleted Uranium in M101 Davy Crockett Spotting Rounds

ddd MMM 2015

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Abbreviations and Acronyms

²³⁴ U	uranium-234
²³⁵ U	uranium-235
²³⁸ U	uranium-238
ASR	Archive Search Report
CFR	Code of Federal Regulations
DOD	Department of Defense
DU	depleted uranium
EOD	explosive ordnance disposal
IMCOM	US Army Installation Management Command
km	kilometer
m	meter
NRC	US Nuclear Regulatory Commission
PSP	Physical Security Plan
RCA	Radiation Controlled Area
RSO	Radiation Safety Officer
RSP	Radiation Safety Plan
UXO	unexploded ordnance

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1 Introduction

This Physical Security Plan (PSP) is applicable at US Army Installation Management Command (IMCOM) ranges that may have been affected by Davy Crockett M101 spotting rounds. The M101 spotting round contains depleted uranium (DU). The affected areas are controlled for radiation safety purposes and are radiation controlled areas (RCAs).

The License Radiation Safety Officer (RSO) will review this PSP annually and update it as necessary. If any updates to this PSP represent a significant change in approach to physical security, then the License RSO will inform the US Nuclear Regulatory Commission of the update.

1.1 Background

Depleted uranium is a byproduct of uranium enrichment, part of the process of manufacturing fuel for nuclear power plants. When uranium is *enriched* in the fissile¹ uranium-235 (²³⁵U) isotope, the leftover uranium is *depleted* in ²³⁵U.² DU is useful in certain commercial and military applications because of its high density, which is about twice the density of lead. It is slightly radioactive, but it poses some chemical toxicity danger to the kidneys if ingested in sufficient quantities, for example, by inhaling DU-laden dust or drinking DU-contaminated water.

The M101 spotting round was a 20-millimeter low-speed projectile, weighing approximately one pound that the Army used as part of the M28 Davy Crockett weapon system from 1960 to 1968. The M28 Davy Crockett weapon system was classified to some extent in the 1960s, and records of its use were guarded.

In 2005, the Army discovered tail assemblies from the M101 spotting round during range clearance before construction of a Battle Area Complex at the Schofield Barracks target impact area in Hawaii. The Army then began investigating various sites where the M101 spotting round may have been used. Characterization studies have determined that NRC-licensable quantities of DU in the form of M101 fragments exist at several IMCOM sites.³

¹ A *fissile* nuclide is a nuclide that is capable of undergoing fission after capturing low-energy thermal (slow) neutrons. This definition excludes natural uranium and DU that have not been irradiated or have only been irradiated in thermal reactors.

² Uranium-234 (²³⁴U) is enriched or depleted as well in enriched uranium and DU, respectively, but it is not fissile.

³ These sites are Schofield Barracks/Pohakuloa Training Area HI, Fort Knox KY, Joint Base Lewis-McChord/Yakima Training Center WA, Fort Riley KS, Fort Polk LA, Fort Benning GA, Fort Campbell KY, Fort Bragg NC, Fort Carson CO, Fort Gordon GA, Fort Hood TX, Fort Hunter Liggett CA, Fort Jackson SC, and Fort Sill OK.

1.2 Purpose

The purpose of this PSP is to address physical security issues involving M101 spotting round DU in RCAs on IMCOM Ranges. The goals are to protect the health and safety of Army personnel and of members of the public; maintain security of licensed material (DU); and meet all applicable Federal, Department of Defense, and Army regulations.

1.3 Scope

This PSP defines the roles and responsibilities of supporting physical security staff, and explains the physical security controls for M101 spotting round DU on IMCOM Ranges.

1.4 Applicability

The requirements of this plan are applicable to all personnel, including members of the public, who may seek access to an RCA.

Requirements of this plan are in addition to, not in lieu of, any and all other physical security requirements, especially those related to unexploded ordnance in or around RCAs.

1.5 The Unexpected and the Unanticipated

While all physical security contingencies are intended to be addressed by this plan, something unexpected or unanticipated may arise. If this occurs, the Garrison RSO will promptly establish appropriate procedures and then inform the License RSO. These procedures will be documented by including them in this plan or as an addendum to it.

2 Physical Security Organization and Responsibilities for M101 Spotting Round DU

2.1 US Army Installation Management Command (IMCOM) Commander

Regarding M101 spotting round DU on IMCOM ranges, the IMCOM Commander is responsible for:

- Physical security and control of M101 spotting round DU
- Completeness and accuracy of the physical security records and all information provided to the NRC
- Knowledge about the contents of the license and application
- Compliance with current NRC regulations and the licensee's operating and emergency procedures
- Commitment to provide adequate resources (including space, equipment, personnel, time, and, if needed, contractors) to the physical security program to maintain security of DU
- Selection and assignment of a qualified individual to serve as the License RSO with responsibility for the overall physical security program
- Prohibition against discrimination of employees engaged in protected activities

2.2 Garrison Commander

Regarding M101 spotting round DU on IMCOM ranges, each Garrison Commander is responsible to the IMCOM Commander for assuring compliance with requirements of NRC regulations and license conditions (including this PSP) on his or her installation.

The Garrison Commander will select and assign a qualified individual to serve as the Garrison RSO with responsibility to the License RSO for Garrison compliance with NRC regulations and license conditions regarding M101 spotting round DU on installation ranges, including physical security of that DU.

2.3 License Radiation Safety Officer

The License RSO is responsible to the IMCOM Commander for the development, implementation, and overall administration of this PSP. He is also responsible to both the IMCOM Commander and the NRC for assuring and monitoring compliance with NRC regulations and license conditions for M101 spotting round DU on IMCOM Ranges.

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The License RSO has authority to:

- Directly contact personnel of IMCOM Headquarters, IMCOM Regions, IMCOM garrisons, and the Army Environmental Command (AEC) in the performance of the License RSO duties⁴
- Task personnel of IMCOM Headquarters, IMCOM Regions, IMCOM garrisons, and the Army Environmental Command (AEC) within their capabilities and resources in order to maintain compliance with NRC regulations and license conditions⁴

Regarding physical security of DU, the License RSO will:

- Coordinate with appropriate personnel as necessary to assure compliance with the requirements of this PSP
- Ensure security of radioactive material
- Act as liaison with NRC and other regulatory authorities
- Provide necessary information on all aspects of physical security to personnel at all levels of responsibility, pursuant to Title 10, Code of Federal Regulations (CFR), Parts 19 and 20, and any other applicable regulations
- Conduct training programs and otherwise instruct personnel in the proper procedures
- Oversee the storage of radioactive waste
- Maintain an inventory of all radioisotopes possessed under the license
- Maintain other records not specifically designated above, for example, records of receipts, transfers, and surveys as required by 10 CFR 20, Subpart L, "Records"
- Hold periodic meetings with, and provide reports to, licensee management
- Perform periodic audits of the physical security program to ensure that the licensee is complying with all applicable NRC regulations and the terms and conditions of the license
- Ensure that the results of audits, identification of deficiencies, and recommendations for change are documented (and maintained for at least 3 years) and provided to management for review; ensure that prompt action is taken to correct deficiencies
- Ensure that the audit results and corrective actions are communicated to all affected personnel
- Maintain understanding of and up-to-date copies of NRC regulations, the license, revised licensee procedures, and ensure that the license is amended whenever there are changes in licensed activities, responsible individuals, or information or commitments provided to NRC during the licensing process.

⁴ HQ IMCOM Operations Order 11-302, Delegation of Authority to Nuclear Regulatory Commission (NRC) License Radiation Safety Officer (RSO) (U), 132138Z Apr 11

2.4 US Army Garrison RSO

The Garrison RSO represents both the Garrison Commander and the License RSO in the day-to-day physical security operations and oversight during routine range activities. The Garrison RSO will maintain records of physical security activities in the RCAs ready for review at any time by the License RSO and by NRC inspectors.

The Garrison RSO, as necessary, will:

- On behalf of the Garrison Commander and License RSO, assure implementation of and compliance with this PSP and applicable NRC regulations and license conditions
- Discuss deviations from routine range activities that affect physical security with appropriate garrison personnel and the License RSO
- Routinely report on physical security activities at Garrison Radiation Safety Committee meetings (with appropriate documentation in the minutes of these meetings)
- Perform audits as necessary to verify compliance with provisions of this PSP and of NRC regulations and license conditions
- Advise personnel as they carry out their physical security responsibilities
- Ensure appropriate physical security training is provided to appropriate personnel and maintain documentation of this training

2.5 Personnel in the RCA

Personnel entering the RCA will receive physical security and DU awareness training (essentially on provisions of this PSP applicable to them) from the Garrison RSO at a level commensurate with their activities in the RCA as the Garrison RSO determines and documents.

Each person who enters the RCA is responsible for strict adherence to physical security rules and regulations.

2.6 Visitors

All visitors to the RCA are required to comply with the requirements of this PSP.

The Garrison RSO or his or her designee will brief authorized visitors requiring entry to the RCA on the presence of DU in the RCA. Visitors will be escorted at all times in the RCA.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within the RCA.

3 Radiation Controlled Areas

The St. Louis District of the US Army Corps of Engineers performed the Archive Search Report (ASR) Project from 2006 to 2011.⁵ The result was a report with annexes for specific installations that described Army efforts to identify Army ranges where the Army M101 fired M101 Davy Crockett spotting rounds. The typical Davy Crockett range impact area is a one-kilometer (km) square, area = $1 \text{ km}^2 = 1,000,000 \text{ m}^2 \approx 247$ acres.

The Army and the NRC consider RCAs to be M101 spotting round impact areas (and any M101 DU-affected areas) identified in ASR annexes. Figures attached to the Radiation Safety Plans (RSP) show the locations of the M101 spotting round impact areas on Garrisons as the ASR Project has determined.

The Garrison RSO and License RSO will be notified when M101 spotting round debris (or any other previously unknown radioactive material) is found on IMCOM Ranges. The sizes and locations of the RCAs will be adjusted and the requirements of this PSP will be extended accordingly.

⁵ USACE St Louis. *Project Archive Search Report: Use of Cartridge, 20mm Spotting M101*. St Louis, Missouri: US Army Corps of Engineers, St Louis District, 2011.

4 Posting Requirements

The Garrison RSO shall post “CAUTION - RADIOACTIVE MATERIAL” signs at a sufficient number of locations around the Radiation Control Area to ensure that individuals entering the Radiation Control Area are aware of the presence of depleted uranium. The signs may be placed at the perimeter of the range impact areas if posting them at the Radiation Control Area boundary is unsafe due to the presence of UXO. The signs may contain additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.

The ranges are operational and essential for Army training and readiness. Access to the ranges and, hence, the RCAs, is otherwise controlled for reasons of security, operations, and/or unexploded ordnance (UXO).

Deliberate searches for and removal of DU from an RCA is not authorized. However, unintended discovery of M101 spotting round DU debris and its location will be reported immediately to the Garrison RSO. The Garrison RSO, in consultation with explosive ordnance disposal (EOD) personnel and the License RSO, will determine whether it is more reasonable to pick up the DU and hold it for appropriate disposal than it is to leave it in place.

Containers of DU held for disposal as radioactive waste will be appropriately labeled with “CAUTION - RADIOACTIVE MATERIAL” labels.

5 Access Control

This section provides specific guidance for access to RCAs. For convenience and reference purposes, it also provides relevant excerpts (with minor edits to suit context) from US Army regulations⁶ and official policy for control of access to Army installations and ranges.

5.1 General

All unescorted persons entering a US Army installation must have a valid purpose to enter, have their identity proofed and vetted, and be issued, or in possession of an authorized and valid access credential.

Federal Personal Identity Verification and valid Department of Defense (DOD)-issued cardholders require identity proofing and vetting to determine fitness and eligibility for access. Persons possessing a DOD-issued Common Access Card are vetted to DOD personnel security standards and shall be considered identity proofed.

Non-Federal Government and non-DOD issued card holders who are provided unescorted access require identity proofing and vetting to determine fitness and eligibility for access.

Garrison representatives shall query the national crime information center database as the Government authoritative data source to vet the claimed identity and to determine fitness, using biographical information including, but not limited to, the person's name, date of birth, and social security number.

5.2 US Army Installations

5.2.1 Training Areas and Range Facilities

The Army controls access to training area facilities to provide maximum training and safety. The Army authorizes access to training area facilities only for conducting official business.

5.2.2 Impact Areas

All impact areas are marked or posted with warning signs, barriers, and/or guards. Passing any hazard warnings without Range Operation's permission is forbidden. Range Operations must approve entry into an impact area.

5.3 RCAs

Personnel access to an RCA is not authorized except with the knowledge and approval of the Garrison RSO. This is because the Garrison RSO must make appropriate arrangements to assure compliance with NRC regulations and license conditions as promulgate in this PSP. The Garrison RSO will assure that all appropriate range

⁶ Army Regulation 190-13, *The Army Physical Security Program*, 2011

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operators, trainers, and security are aware of this requirement. This requirement is in addition to and not in lieu of any other approvals for access that may be required.

Whenever personnel access to an RCA is required, the Garrison RSO will establish a minimum number of access control points on the RCA's perimeter for entry and exit (except in an emergency), known as "hot-lines."

Personnel otherwise qualified to enter the RCA will escort official visitors.

The Garrison RSO will refer to the License RSO for additional guidance as necessary.

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6 Markings on Containers and Equipment

Title 10 CFR Part 20, § 20.1904 requires that all containers that contain more than 100 microcuries of ^{238}U or of natural uranium⁷ be properly labeled with a “CAUTION—RADIOACTIVE MATERIALS” sign or label. The label will also provide information, such as the radionuclides present (DU), an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, and kinds of materials, to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

The specific activity of DU is about 0.4 microcurie per gram, so 100 microcuries of DU has a mass of about 40 grams or 3 ounces. A single, intact M101 spotting round contains about 190 grams of DU.

The only containers of M101 spotting round DU on the installations should be containers of DU held for disposal as radioactive waste.

⁷ The activity in DU is mostly due to ^{238}U . The activity in natural uranium is mostly due to ^{234}U and ^{238}U in equilibrium with each other. Table C in Appendix C to 10 CFR Part 20 does not list DU explicitly, but the inference is taken that the labeling requirement for an activity of more than 100 microcuries should also apply for DU.

7 Radioactive Waste

The Garrison RSO will, in coordination with EOD personnel, double-bag in plastic bags all M101 spotting round DU that is picked up and removed from the RCA. Anyone handling DU will use tools or gloved hands to handle it. The bags then will be stored in sturdy containers with appropriate markings.

The Garrison RSO will secure these containers in a locked storage facility with access limited to personnel appropriately trained in radiation safety and security.

The Garrison RSO, in coordination with the License RSO, will contact Chief, Army Low-Level Radioactive Waste Disposal Division, US Army Joint Munitions Command, ATTN: AMSJM-SF, Rock Island Arsenal, Rock Island, IL 61299-6500, who will arrange for appropriate disposal of the DU.

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8 Program Audits

Each Radiation Safety Program audit will include an assessment of the effectiveness of this PSP.

The License RSO or his or her designee will review the physical security program content and implementation and document the results of this review at least annually to ensure the following:

- Compliance with NRC and the terms and conditions of the license
- Records of audits and other reviews of program content are maintained for 3 years

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9 Training

Before RCA entry, all personnel (except one-time visitors; see section 2.6) will receive and acknowledge training on essential elements of this PSP. The Garrison RSO or his or her designee will conduct this training as part of radiation safety training.

The essential elements of DU physical security training for non-physical security personnel are:

- Access to RCAs is authorized only in accordance with the RSP and this PSP
- Notify the Garrison RSO if DU is found in a location where it was not previously known
- Do not pick up or remove DU from a range except as authorized by and under the supervision of the Garrison RSO, who will coordinate with the License RSO

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