



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

**REGION II
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October 6, 2000

Department of the Navy
Naval Radiation Safety Committee
Chief of Naval Operations (N-45)
ATTN: ADML L. Baucom
Chairman
Room 636
2211 S. Clark Place
Arlington, VA 22244-5108

SUBJECT: NRC INSPECTION REPORT NO. 45-23645-01NA/00-09

Dear Admiral Baucom:

This refers to the inspection conducted on September 11, 2000, of the depleted uranium (DU) ammunition recovery activities performed by naval and contractor personnel on the Live Impact Area of the Atlantic Fleet Weapons Training Facility on Vieques Island, Puerto Rico. The enclosed report presents the results of this inspection. The purpose of the inspection was to determine if the recovery operations were carried out in a radiologically safe manner and in accordance with the "Survey Work Plan for Depleted Uranium (DU) Penetrators" that was submitted to the NRC for review on January 10, 2000, and subsequently amended on August 18, 2000.

During the inspection, direct observations related to the recovery of DU ammunition were made by the inspector, and discussions were held with key individuals. Within the scope of the inspection, violations were not identified.

The NRC determined that the DU recovery activities were performed in a radiologically safe manner and that coordination problems in clearing dense vegetation in areas where unexploded ordnance was present, which previously affected the recovery of DU penetrators, had been resolved. This resulted in the full implementation of the survey plan. The NRC will continue to monitor the Navy's efforts in response to DU firing incident.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Should you have any questions concerning this letter, please contact us.

Sincerely,

/RA by D. Collins Acting for/

Jay L. Henson, Chief
Materials/Licensing Inspection Branch 2
Division of Nuclear Materials Safety

Docket No. 030-29462
License No. 45-23645-01NA

Enclosure: NRC Inspection Report
No. 45-23645-01NA/00-09

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 030-29462

License No.: 45-23645-01NA

Report No.: 45-23645-01NA/00-09

Licensee: Department of the Navy

Date: September 11, 2000

Inspector: Héctor Bemúdez, Senior Health Physicist

Approved by: Jay L. Henson, Chief
Materials Licensing/Inspection Branch 2
Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Department of the Navy
NRC Inspection Report No. 45-23645-01NA/00-09

This special, announced inspection was conducted to continue to evaluate the recovery activities performed by the licensee on the Live Impact Area of the Atlantic Fleet Weapons Training Facility on Vieques Island, Puerto Rico. The purpose of the inspection was to determine whether the recovery operations performed by the Navy and its contractor were carried out in a radiologically safe manner and in accordance with the "Survey Work Plan for Depleted Uranium (DU) Penetrators" that was submitted to the NRC for review on January 10, 2000, and subsequently amended on August 18, 2000. Within the scope of the inspection, violations were not identified.

The NRC determined that the DU recovery activities were being performed in a radiologically safe manner and that coordination problems in clearing dense vegetation in areas where unexploded ordnance was present, which previously affected the recovery of DU penetrators, had been resolved. This resulted in the full implementation of the survey plan.

A total of approximately 22 equivalent penetrators of the remaining 169 DU penetrators were recovered by the team during this recovery attempt. When DU penetrators were recovered that were fractured or fragmented, the recovery team accounted for them by adding up the "pieces" until the dimensions of a full penetrator were approximated. This composite is termed an "equivalent penetrator." Approximately 147 DU penetrators remain unaccounted for. The NRC will continue to monitor the Navy's efforts in response to the DU firing incident.

Attachment:

List of Persons Contacted
Inspection Procedure Used
List of Acronyms

REPORT DETAILS

1. Background

On February 19, 1999, during a training exercise, two U. S. Marine Corps Harrier aircraft expended 263 ammunition rounds containing depleted uranium (DU) on the Live Impact Area (LIA) of the Atlantic Fleet Weapons Training Facility on Vieques Island, Puerto Rico, in violation of the Navy's NRC license. NRC Inspection Report No. 45-23645-01NA/00-01 dated April 19, 2000, discusses the NRC's review of the event and the Navy's initial response. NRC Inspection Report No. 45-23645-01NA/00-04 dated July 13, 2000, discusses the NRC's review of a DU recovery operation and the Navy's commitment to return to the site for more recovery activities. The NRC's Environmental Survey Report dated September 28, 2000, discusses the NRC's response to public concerns about the potential spread of radioactive contamination into the environment. The Environmental Survey Report concluded that radioactive contamination had not spread beyond discrete areas within the LIA, a restricted area. This report describes the Navy's return to the site to recover more DU from the LIA.

2. Radiological Safety

a. Scope

The inspection was conducted, in part, to determine if the licensee continued to perform the DU recovery operations in a radiologically safe manner. The inspector directly observed recovery operations at the LIA and interviewed various members of the recovery team.

b. Observations/Findings

Through direct observation of and discussions with personnel involved in the recovery of DU ammunition from the LIA, the inspector determined the following:

- (1) When areas were identified as potential locations of DU penetrators, recovery personnel used Ludlum® Model 2350 Survey Meters coupled with 2" by 2" sodium iodide (2X2 NaI) detectors, to carefully survey soil as it was removed. Very small amounts of soil above and around each penetrator were removed using a standard garden hand trowel. Each "scoop" was carefully surveyed. If the survey instrument's count rate indicated the presence of DU, recovery personnel collected the soil in a plastic bag for disposal. Once the penetrator was visualized, recovery personnel carefully collected it in a plastic bag, as well. Soil located around the collected penetrator was collected for disposal until the survey instrument's count rates indicated an absence of DU contamination in that location, i.e., less than twice the background count rate. Background count rates ranged from less than 1500 counts per minute (cpm) to approximately 3500 cpm.
- (2) At the completion of each DU penetrator recovery evolution, recovery personnel carefully surveyed the trowels, their gloves, and their clothing for DU contamination. The DU contamination was observed by the inspector to be discreet particles or flakes, bright yellow in color (as a result of oxidation), that were easily visualized and collected. The DU contamination did not tend to adhere to trowels, gloves, soil grains, or clothing.

The inspector determined that contamination control did not pose any significant difficulty for recovery personnel. This fact was established when it was observed that the survey instruments' background count rates did not increase, and daily quality assurance checks remained constant with no decontamination of the detectors.

- (3) As each DU penetrator, or penetrator fragment, was located and collected, various amounts of associated soil was also collected. The amount of soil collected was dependent upon the depth at which the penetrator was located below the surface of the soil. Penetrators were located at depths ranging from the surface of the soil to 18 to 20 inches below the surface of the soil. Recovery personnel carefully collected the penetrators and soil in plastic bags and subsequently placed them in marked containers for eventual collection, packaging, and shipping as low level radioactive waste.
- (4) Radiation levels measured by the inspector and the recovery team were sufficiently low so as not to pose an external radiation exposure hazard.

c. Conclusions

The NRC inspector determined that the recovery of DU ammunition from the LIA on Vieques was performed in a radiologically safe manner. No violations of NRC requirements were identified.

3. Depleted Uranium Recovery Team's Adherence to "Survey Work Plan"

a. Scope

The inspection was also conducted, in part, to assess the Navy's DU Recovery Team's adherence to the "Survey Work Plan" submitted to the NRC on January 10, 2000, and subsequently amended on August 18, 2000. The inspector reviewed the amended "Survey Work Plan," directly observed naval personnel perform surveys and scans of the affected areas, and interviewed various members of the recovery team.

b. Observations/Findings

Through direct observation of and discussions with personnel involved in the recovery of DU ammunition from the LIA, the inspector determined the following:

- (1) As described in the amended "Survey Work Plan," the recovery team utilized a commercial differential global positioning system (DGPS) and data management system in conjunction with commercial radiation detection equipment. The computer compiled the count rates from each detector, as well as the position of the detectors. This data was then plotted, giving the recovery team visual indications of elevated count rates, relative to a specific point in the affected area. This methodology was used to identify locations where there was a high probability of locating a penetrator.
- (2) Licensee representatives stated that quality assurance tests were performed each day, prior to the initiation of scanning as follows: (1) each detector was tested with a National Institute of Standards and Technology (NIST) traceable source with known activity for the purpose of ensuring that the detectors were performing as expected; and (2) the

entire system was also tested for consistent and expected operation each day, prior to scanning areas for the presence of DU penetrators.

- (3) In areas clear of heavy vegetation and brush, the global positioning system was performing as expected.
- (4) The Navy's "Survey Work Plan," requires that all brush in the survey area be removed or cut to a height of no more than four inches (Section 9.1). The inspector confirmed that coordination problems encountered with the removal of unexploded ordnance in areas planned for scanning during the previous inspection, which affected recovery operations, had been resolved. The inspector found excellent coordination between personnel clearing the unexploded ordnance and those clearing large vegetation, so that appropriate surveys could be made.
- (5) Upon completion of its review of the Navy's "Survey Work Plan," the NRC provided comments to the Navy that should be addressed regarding how the Navy plans to disposition the issue of potential residual contamination or unrecovered DU penetrators. The inspector interviewed the Officer in Charge about the status of this issue. The Officer in Charge indicated that the focus of the work being performed was to recover as many DU penetrators as possible, and that Navy had not completed its evaluation of these longer term issues. The Navy's position on potential residual contamination and potential unrecovered DU penetrators remains unresolved.

c. Conclusions

The NRC inspector determined that the recovery team adhered to the guidance of the amended "Survey Work Plan." The team recovered approximately 22 of the remaining 169 equivalent DU penetrators. Coordination problems in clearing dense vegetation, so that appropriate surveys could be performed, had been resolved. As of the date of this report, approximately 147 penetrators have not been recovered.

EXIT MEETING SUMMARY

An exit meeting was held with the Officer in Charge of the DU penetrator recovery team on September 11, 2000. The overall scope and findings of the inspection were discussed. No dissenting comments were received.

ATTACHMENT

LIST OF PERSONS CONTACTED

CDR S. Doremus, Navy Project Manager
Mr. W. Haney, Contractor Project Manager
Numerous Explosive Ordnance Disposal and Radiation Survey Personnel

INSPECTION PROCEDURE USED

87103 - Inspection of Materials Licensees Involved in an Incident or Bankruptcy Filing

LIST OF ACRONYMS

cpm - Counts per Minute
DGPS - Differential Global Positioning System
DU - Depleted Uranium
LIA - Live Impact Area
NaI - Sodium Iodide
NIST - National Institute of Standards and Technology
NRC - Nuclear Regulatory Commission