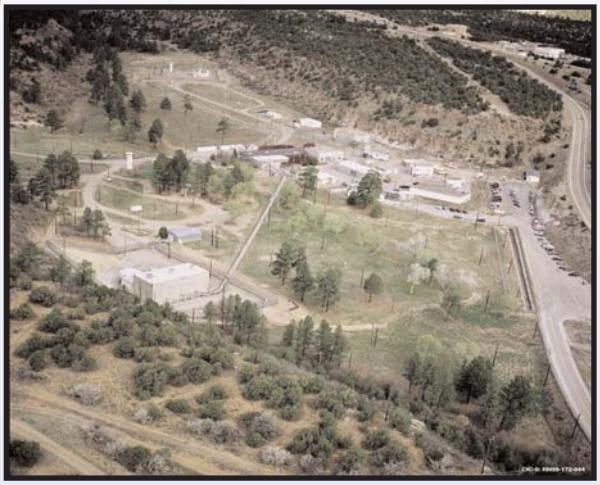
Stockpile Stewardship

Criticality Experiments Facility Project

Introduction

Technical Area 18 (TA-18), located at Los Alamos National Laboratory (LANL) in New Mexico, is the nation's only facility capable of performing general-purpose nuclear materials handling for a variety of experiments, measurements and training. As one of the major training facilities for DOE personnel, TA-18's principal operation is to conduct research in the design, development, construction, and application of experiments on nuclear criticality. It houses the western hemisphere's largest collection of machines for conducting experiments to validate safety evaluations and establish limits for operations that involve nuclear materials. The facility supports important defense, nuclear safety and national security missions.



Technical Area 18 at Los Alamos National Laboratory.

In December 2002, the U.S. Department of Energy (DOE) announced its decision to relocate TA-18 mission and testing equipment to the Device Assembly Facility (DAF) at the Nevada Test Site. This will enable the National Nuclear Security Administration (NNSA) to quickly establish critical national security missions in Nevada while consolidating special nuclear materials in a newer, more secure facility. Accordingly, the western section of the DAF is now designated as the Criticality Experiments Facility (CEF).

Background

The CEF Project involves the planning, designing, and execution of retrofitting the DAF and reconfiguration of the machine controls system to successfully relocate the TA-18 mission. NNSA is responsible for ensuring the safety and reliability of the existing nuclear weapons stockpile and supporting programs that reduce global nuclear proliferation. These mission responsibilities are accomplished through the use of a DOE core team of highly trained nuclear experts. The operations at TA-18 enabled DOE personnel to gain knowledge and expertise in advanced nuclear technologies that support the following areas:

- Nuclear materials management and criticality safety
- Emergency response in support of counterterrorism activities
- Nuclear Nonproliferation in support of domestic and international programs to control excess nuclear materials
- Criticality experiments in support of Stockpile Stewardship and other programs.
- Training activities to develop and maintain capabilities and expertise within the national nuclear materials handling community.

The CEF Project

Relocation of the TA-18 missions and necessary support logistics to the DAF is a complex retrofit project. The project is divided among National Security Technologies LLC, LANL, and Lawrence Livermore National Laboratory (LLNL) as the execution entities and is integrated by the Central Project Office (CPO). The CPO Project Manager is responsible to NNSA for all project execution, integration, and reporting. The CEF Project scope includes the successful completion of all design/engineering, construction, machine relocation, control system installation, acceptance testing, and successful completion of operational readiness reviews for four criticality assemblies: Godiva, Planet, Flattop, and Comet. Godiva is a burst machine; Planet and Comet are vertical lift tables; and Flattop is a fast neutron benchmarked assembly.

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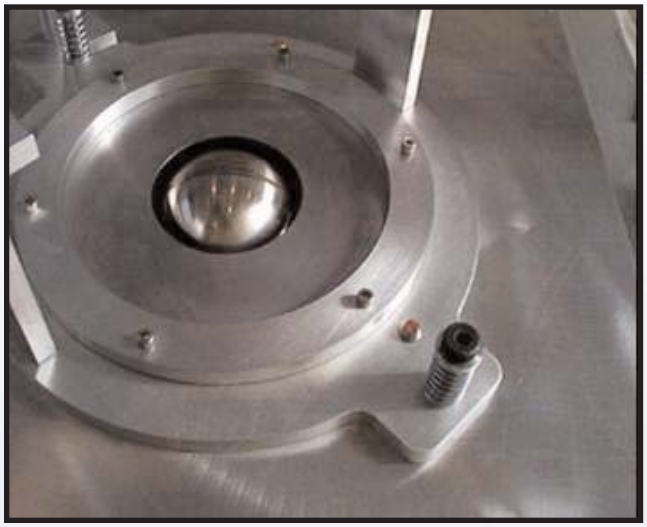
Criticality experiments



The Planet is one of four criticality assemblies.

Safety is paramount when nuclear materials are involved. Conducting criticality safety evaluations for process operations requires use of a credible experimental database. The Stockpile Stewardship management mission involves working with nuclear materials in different concentrations and contexts than in the past. As a result, the existing database of knowledge is no longer adequate for conducting the evaluations or defining limits of safe handling. Today, knowledge developed from criticality experiments is essential to testing and qualifying new calculations by expanding on existing data. It is also necessary for qualifying and testing such equipment as criticality alarms and nuclear accident dosimeters (or radiation devices).

Emergency response

Combining their expertise and nuclear material inventory, the facility's staff is able to create realistic target devices used to develop, test and validate emergency response equipment, methods and diagnostic procedures. To train emergency response teams on weapons that might be used by terrorists, facsimiles of U.S. weapons and theoretical foreign designs are supplied for instructional use. Over 400 professionals train at the facility annually.

Nonproliferation, safeguards and arms control

Part of the CEF mission is to provide the technology that enables the nation to respond to the threat of nuclear weapons proliferation. These technologies provide the verification of declarations made by other nations concerning their nuclear weapons. Another key to countering the proliferation of nuclear weapons and terrorism is in developing and evaluating equipment for and training of law enforcement and first responder teams. Training objectives often require the use of a range of actual nuclear materials all in one location.

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