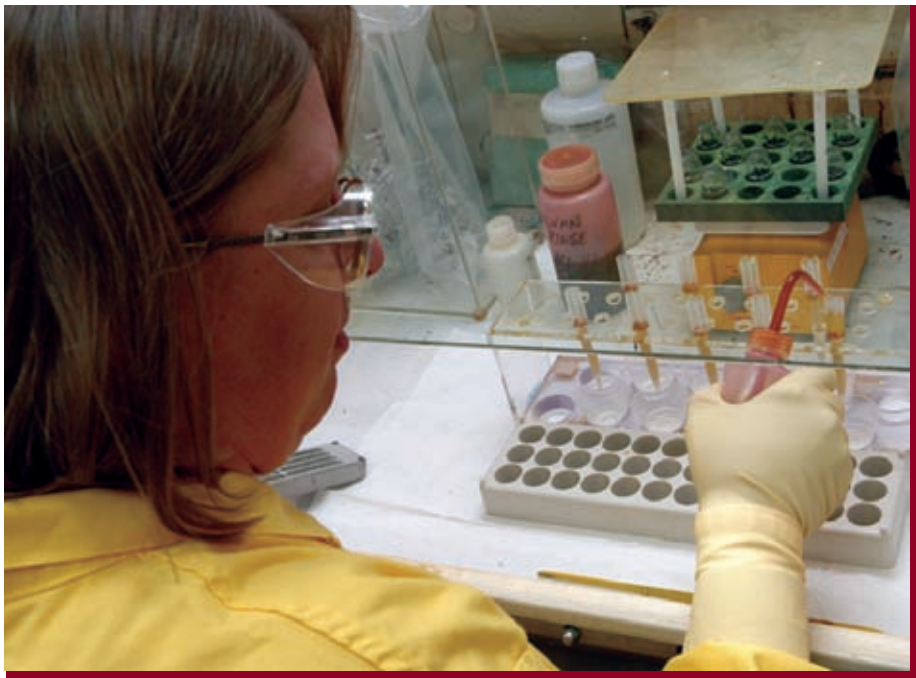
July 2007

National Nuclear Security Administration Washington, DC 20585



ENSURING QUALITY: A technician prepares the solutions for analysis of chemical composition. This ensures that the material meets quality requirements for entry into the U.S. nuclear weapons stockpile. See pages 4 and 5 for more on Los Alamos National Laboratory's completion of the first war-reserve quality plutonium pit.

In This Issue

NNSA Completes Successful Nonproliferation Partnership

A three-year NNSA collaboration with a Russian technology firm has been completed with the unveiling of new software that will accelerate the development of a next generation of engines for applications ranging from power generation to aviation. The technology was developed under NNSA's Global Initiatives for Proliferation Provention (GIPP) program, which, among other efforts, helps to control the spread of nuclear expertise by redirecting former nuclear weapons designers into peaceful, civilian ventures.

"In addition to stopping nuclear materials and technology, nonproliferation efforts must also address the threat of vulnerable nuclear expertise. This multi-year research and development effort will help to develop a new generation of energy efficient heat engines, and has the added benefit of providing former Russian nuclear weapons scientists with sustainable, commercial work," said William Tobey, NNSA's top nonproliferation official.

(continued on page 2)

U.S. Nuclear Strategy Delivered To Congress

Secretary of Energy Samuel W. Bodman joined the U.S. Secretaries of Defense and State in sending to Congress the Bush Administration's nuclear weapons strategy. This document not only describes the history of nuclear deterrence during the Cold War, but reinforces how deterrence applies to present and future security threats, and what a nuclear stockpile of the 21st century will need to look like in order to meet those threats.

The strategy emphasizes the administration's goal of maintaining a credible nuclear deterrent with the lowest possible number of nuclear weapons. It is consistent with the Moscow Treaty that sets

(continued on page 2)

U.S. Nuclear Strategy Delivered To Congress

(continued from page 1)

U.S. and Russian operationally deployed strategic nuclear forces at 1,700-2,200 by 2012. The policy document also supports the President's 2004 directive to cut the overall U.S. nuclear weapons stockpile almost in half, so that in just five years the nuclear arsenal will be at its lowest level since the Eisenhower administration in the 1950s.

"We are committed to maintaining the nuclear weapons stockpile, but as our Cold War-era weapons age this becomes more and more difficult and very costly," said Secretary Bodman. "This document clearly lays out the best actions we can take in the face of an uncertain future."

The document reiterates the U.S. commitment to maintaining a secure, safe and reliable nuclear weapons stockpile into the future, without the use of underground nuclear testing, for the security of both the United States and its allies. The strategy also describes NNSA's proposed Reliable Replacement Warhead as the best means for ensuring the future nuclear deterrent, while allowing for a decrease in the size of the stockpile.

Excerpt from *National Security and Nuclear Weapons: Maintaining Deterrence in the 21st Century*

"Without Congressional support for the Reliable Replacement Warhead program we are concerned for the long-term ability of the United States to sustain its strategy of deterrence, meet its security commitment to allies, and pursue further reductions in nuclear weapons without assuming additional risk. Delaying progress on RRW will force the United States to maintain a large stockpile of nuclear weapons and sustain it through increasingly costly and risky Life Extension Programs. Delays on RRW also raise the prospect of having to return to underground nuclear testing to certify existing weapons.

"Maintaining a credible deterrent has required a decades-long, bipartisan partnership with Congress; this partnership will be no less critical in the future than in the past. Over the next two decades Congress will make many decisions, including decisions on RRW, that will help determine how fast and how far the United States can go in transforming and reducing its nuclear forces, nuclear stockpile, and nuclear infrastructure to make them smaller, safer, more secure, and more appropriate to managing the risks and challenges of the 21st Century. We must make progress toward creating a nuclear weapons infrastructure that can respond quickly and effectively to emerging threats and to technological surprise. This will assure our ability to maintain deterrence over the long-term, and enable future reductions in both the operationally deployed force and the overall nuclear weapons stockpile."

NNSA Completes Successful Nonproliferation Partnership

(continued from page 1)

Under the GIPP program, a partnership was established between General Electric's Global Research, Kinetic Technologies (a Russian technology firm which spun off from a former Russian weapons institute) and Argonne National Laboratory to develop the software.

Kinetic's former Russian nuclear weapons designers and software engineers worked with scientists from General Electric to develop software that can predict the operation and performance of next-generation combustion systems. Applications of this software will help in the development of a next generation of high performance, energy efficient, cost-saving engines. This could lead to new, more environmentally friendly engines in the transportation, energy and aviation sectors.

The goal of the GIPP program is to team private U.S. businesses with former weapons of mass destruction (WMD) scientists and engineers to work together on high technology research and development projects that have commercial applications. NNSA facilitates the partnerships through its national laboratories and U.S. companies which are members of the United States Industry Coalition.

NNSA has engaged over 16,000 former WMD specialists and helped to create over 5,000 civilian jobs. Most of the program's efforts have been directed at the displaced workforce in the large, former Soviet Union's weapons complex. More recently, the program has engaged scientists in Libya and Iraq.

YTIP Improving Y-12's Response Time, Efficiency

NNSA's Y-12 Throughput Improvement Plan (YTIP) is making a significant impact in improving the Y-12 National Security Complex's responsiveness and efficiency.

Throughput is a computing term related to the amount of data transferred from one place to another or processed in a specified amount of time. Within NNSA's nuclear weapons complex, it means meeting commitments on time and within budget.

Patterned after the successful throughput improvement effort at the Pantex Plant where changes in procedures and authorization basis documents doubled throughput, YTIP focuses on 13 improvement actions involving four primary categories: security; production processes; design agency requirements and specifications; and prioritization of work.

"What makes YTIP different from other productivity improvement efforts is the integration of actions and participants from across the nuclear weapons complex, which is essential for success because some of the primary issues cannot be overcome through Y-12's efforts alone," said Robbie Cordani, Y-12's deputy manager of manufacturing and YTIP leader.

Because of YTIP, Y-12 has made dramatic improvements in productivity in certain critical areas that were once constraining production throughput. In fact, Y-12 has more than doubled its throughput in key areas in a very short time since YTIP was initiated, according to Cordani.

IMPROVING EFFICIENCY: Y-12 employee working at a glovebox. YTIP will add more than 100 days of productive work time across several operations at Y-12.

Championed by Steve Goodrum, NNSA assistant deputy administrator for military application and stockpile operations, YTIP targets issues that require support from the design agencies, other nuclear weapons complex sites, and NNSA headquarters.

Goodrum and his senior management team meet on a monthly basis to review the status of the improvement actions, ensure full integration and support of the effort, monitor the process to institutionalize the throughput improvements and challenge the design agencies and production sites to seek new actions to increase overall production efficiency.

A key YTIP goal is to provide Pantex with a 90-day lead time between receipt of material from Y-12 and delivery to the military.

GRADUATION DAY: Energy Secretary Samuel W. Bodman poses with graduates of the NNSA Office of Secure Transportation (OST) agent candidate graduation class of 2007. The Secretary addressed the graduates and performed the swearing-in ceremony for this elite class of 12 federal agents whose mission is the safe and secure transport of the nation's nuclear assets. The event was held at Ft. Chaffee, Ark. where OST maintains its primary training facility. The new federal agents will support OST's three agent commands located at Albuquerque, N.M.; Amarillo, Texas; and Oak Ridge, Tenn.

Diamond-Stamped: Los Alamos

In the nuclear weapons world, a diamond-shaped marking stamped on a plutonium pit denotes "war-reserve quality," meaning it is certified for inclusion in the U.S. nuclear weapons stockpile. The diamond stamp signifies that the product has been built to the strictest rigor and to the highest quality standards required by NNSA and the Department of Defense.

That stamp is now on the first war-reserve quality pit manufactured in the United States since the Rocky Flats Plant in Colorado ceased operations in 1989. The pit was successfully fabricated at NNSA's Los Alamos National Laboratory (LANL) in New Mexico. NNSA has directed the resumption of pit manufacturing in the United States and has oversight of LANL's Pit Manufacturing and Certification Program. This exceptional accomplishment for the Stockpile Stewardship Program drew on the broad scientific, engineering and management skills of the laboratory and the nuclear weapons complex.

The war-reserve pits built at Los Alamos will replace pits that have been or will be destructively analyzed as part of the surveillance program of the W88 warhead. These analyses ensure the continued safety, security and reliability of this key element of the nation's nuclear deterrent.

In its fabrication regimen, LANL has increased the use of environmentally benign solvents and lubricants, altered some processes, including the type of welding process for various joints, and developed methods to make certain that highly reactive plutonium did not exhibit undue corrosion upon assembly into the pit. Because nuclear testing was not a certification option, an overriding factor was to ensure that pits produced were functionally equivalent to those manufactured at Rocky Flats. This was accomplished through a suite of targeted certification tests.

PIT CERTIFICATION: Downdraft room assembly of a supported certification on new pits into the stockpile.

DOMENICI TALK: Sen. Pete Domenici (NM) addresses employees in the TA-55 auditorium. "Stockpile Stewardship has been a fantastic success. It has been a pretty exciting life that I've lived and part of that is because of Los Alamos, and I thank you for that." Seated (left to right) are Glenn Mara, principal associate director for weapons programs; Dan Glenn, acting Los Alamos Site Office manager; U.S. Representative Heather Wilson (NM); and Michael Anastasio, Los Alamos National Laboratory director.

In 2003, LANL produced the first pit built with qualified processes. Since delivering the qualified pit, their scientists and engineers have worked to demonstrate the functionality and equivalency of a Los Alamos-built pit compared with a Rocky Flats-built pit. This has been demonstrated through targeted engineering and physics tests on LANL-built qualified pits.

In addition to Los Alamos, other parts of NNSA's nuclear weapons complex contributed to the efforts. The Lawrence Livermore National Laboratory supplied radiographic inspection capabilities, produced small

Completes First War-Reserve Pit

scale plutonium samples for testing and provided engineering evaluations and technical peer reviews. The Kansas City Plant

a subcritical test assembly. This assembly

provided engineering support and tooling manufacture expertise to streamline the project. Sandia National Laboratories supported manufacturing and calibration efforts.

Examples of pit fabrication activities include: casting, machining, joining, and assembling components, and performing chemical analyses, mechanical inspections, or radiographic evaluations.

This first diamond-stamped pit has been delivered to NNSA's Pantex Plant in Texas for assembly into a W88 warhead, which, when certified, will be delivered to the U.S. Navy. In 2007, LANL is scheduled to build and submit 10 pits to NNSA for acceptance. A minimum of three diamond-stamped pits will be delivered to Pantex this year.

TESTING REQUIREMENTS: Preparation of samples for testing of quality requirements to allow pits to be accepted into the stockpile. These samples are then dissolved into analytical chemistry aliquots.

Rocky to LANL: High Standards Met

To ensure that LANL-manufactured pits met the same high standards as Rocky Flats pits, a series of nine "development" pits were manufactured and exhaustively tested (1998-2002) to answer critical issues facing the design and manufacturing communities, including:

- Judging how well an important welding process had transferred from Rocky Flats to LANL;
- Comparing the results of environmentally friendlier manufacturing processes at LANL with Rocky Flats manufacturing processes;
- Comparing the surface reactivity of plutonium fabricated at LANL with results of historical tests done at Rocky Flats and how the different LANL glovebox atmospheres affected the plutonium fabrication process;
- Fabricating intentional defects into pits to test the quality of the nondestructive testing process; and,
- Combining pit components manufactured at both Rocky Flats and Los Alamos and directly measuring reactivity and mechanical differences to ensure that no significant differences could be discerned among the materials manufactured using different processes.

Y-12 SHIFT CHANGE: Ed Westcott, the official photographer for the Manhattan Project and later the Atomic Energy Commission, is surrounded by (from left) Alice Piercey, Dorothy Coker, Lillie Allred and Marie Guy, four of the women pictured in Westcott's famous "Y-12 Shift Change" photo. The photo was taken in 1945 near the end of World War II and is considered one of the most memorable Wescott photographs from that period. A 20-feet-by-50-feet (background) image of the photo is in the cafeteria of the sprawling Jack Case Center, a new office facility that will house about 1,200 Y-12 employees. The Jack Case Center and the New Hope Center, Y-12's new visitor and badging facility, were recently dedicated in ceremonies held at Y-12.

Sandia's Weapons Evaluation Test Lab At Pantex Gets Green Building Certification

NNSA's Sandia National Laboratories (SNL) Weapons Evaluation Test Laboratory (WETL) at the Pantex Plant near Amarillo, Texas, has received the Leadership in Energy and Environmental Design (LEED®) building certification. The award is given by the U.S. Green Building Council (USGBC).

"This is a significant award," said G. David Jones, manager of the department that operates WETL. "It shows that our building is environmentally friendly, not only in the way that it was constructed, but also in how we've maintained it to meet clean environment standards since it was built."

USGBC awards certification only after a facility meets stringent requirements that include building design, efficient utility use, and maintenance activity - down to the types of cleaning materials used.

The 22 million dollar state-of-the-art facility, designed to conduct systems-level non-nuclear tests on nuclear weapons and components, opened in October 2004, replacing a 40-year-old laboratory at the site. It houses more than 90 million dollars worth of testing equipment and consists of modern offices and laboratory facilities for about 20 staff members, a state-of-the-art video conference room, transition high-bay work space, and sufficient dock space for receiving and shipping. The architect for the project was Hays, Seay, Mattern & Mattern, Inc. of Roanoke, Va.

WETL, which is operated by SNL for NNSA, is a key part of NNSA's Stockpile Stewardship Program. Its mission is to support the timely evaluation of the "state of health" of the U.S. nuclear weapons stockpile through subsystem level testing in a laboratory environment in accordance with predefined test plans.

The LEED Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high-performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their building's performance. LEED promises a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health, including sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

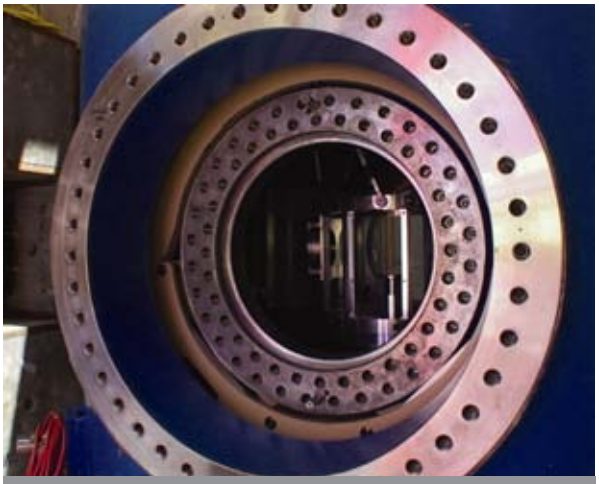
DARHT Conducts Fully Contained Hydrotest

NNSA's Dual Axis Radiographic Hydrotest (DARHT) facility at Los Alamos National Laboratory (LANL) has successfully fired its first-ever fully contained, high-explosive (HE) experiment inside a steel containment vessel. This test marks the beginning of an era of fully contained tests at DARHT, as virtually all future testing at the facility will be conducted inside huge steel vessels, eliminating nearly all environmental hazards.

Hydrodynamic tests are HE-driven experiments that produce radiographs and other data from implosions of mock nuclear weapons components. NNSA uses the tests to confirm, support, and inform computer models and weapons codes to manage the nuclear weapons stockpile.

"This hydrotest was the culmination of almost a decade of work, and required the dedicated efforts of a large cross-section of the laboratory," said David Bowman of LANL's Radiographic and Pulse-Power Systems. "Excellent teamwork by all involved resulted in a return of very high quality data."

The experiment, also called a dynamic core punch test, was the first to occur inside a containment vessel to prevent releasing the explosion's by-products, including pieces of metal shrapnel, into the environment. Post-test sampling and monitoring confirmed that the experiment was completely contained, according to Bowman.



FULLY CONTAINED HYDROTEST: Peering inside the large steel containment vessel gives a perspective on its massive size and its two-inch thick steel walls.

One of the major issues at DARHT is the length of time between experiments due to the cleanup requirements at the firing point after all tests. With the move to fully contained experiments, program managers hope that not only will the laboratory gain from a more environmentally responsible stance, but also will be able to conduct more tests in less time.

It also was the first DARHT hydrotest to utilize a unique "Bucky Grid" camera system. The system significantly improves the quality of the radiographic data and enhances the ability to perform quantitative radiographic analysis. Simple Bucky Grids are already used in medical X-ray imaging, and are devices that produce highly parallel beams of X-rays, thereby reducing scatter and improving image quality.

NNSA Supercomputer Tops List Of 500 Fastest Machines For Record Sixth Straight Time

NNSA's BlueGene/L (BG/L) supercomputer at Lawrence Livermore National Laboratory topped the list of the world's fastest computers for a record sixth straight time, according to the new Top500 list released at the International Supercomputing Conference in Dresden, Germany.

Built for NNSA by IBM, BG/L clocks in at 280.6 teraFLOPS (trillion floating point operations per second) on the LINPACK, the industry standard for supercomputer performance. BG/L is a workhorse machine for NNSA's Stockpile Stewardship Program to ensure the safety, security and reliability of the nation's nuclear deterrent without underground nuclear testing.

NNSA's Advanced Simulation and Computing (ASC) program's 100 teraFLOP Purple system, another IBM-built machine at Lawrence Livermore, dropped from fourth to sixth on the Top500 list.

The detailed computer simulations of nuclear weapons performance produced by the ASC program using BG/L, Purple and other supercomputers are a cornerstone of stockpile stewardship. ASC is a tri-laboratory program that unites the high performance computing expertise of NNSA's Los Alamos, Lawrence Livermore and Sandia national laboratories.

Department of Energy (DOE) systems also hold the number two and three rankings on the Top500 list: the upgraded Cray XT4/XT3 at Oak Ridge National Laboratory ranked No. 2 with a benchmark performance of 101.7 teraFLOPS, and Sandia National Laboratories' Cray Red Storm system ranked third at 101.4 teraFLOPS.

DOE and NNSA laboratories house four of the world's fastest supercomputers.

Small Thermos Experiments At Nevada Test Site Yield Excellent Data On Stockpile

The last in a series of 12 plutonium experiments, referred to as the Thermos experiments, have been conducted by NNSA's Los Alamos National Laboratory (LANL) at the Nevada Test Site (NTS). The highly successful experiments provided excellent data and were completed on schedule and within budget.

"The NTS plays a key role in the Stockpile Stewardship Program by providing facilities for conducting experiments on nuclear material," said NNSA Nevada Site Office Manager Jerry Talbot. "The data generated from these experiments will help the NNSA in their mission to certify the safety and reliability of the nuclear stockpile."

Thermos experiments are conducted in a robust, cylindrical vessel about the size and shape of a large coffee thermos, hence the name. Scientists shock or impact a tiny piece of plutonium, housed in this container, with a very small amount of chemical high explosive. The plutonium is separated from the explosives by a thin piece of metal. This allows the shock wave to impact the plutonium without contaminating it with explosive residue. The experiments conducted underground at NTS allow scientists to capture high-power X-ray images of the shock wave as it travels through the plutonium.

The objective is to evaluate how plutonium, produced at LANL, will perform after exposing it to a high-energy shock. "The data will be used to improve our understanding of materials physics and validate three-dimensional modeling results," said LANL's Curt A. Bronkhorst, Ph.D. "This will enhance our ability to more accurately model nuclear detonations."

Because of the small amount of plutonium used, it was not possible for criticality (enough mass to sustain a chain reaction) to occur.

The 12 experimental packages were sent back to LANL for more in-depth examination, providing additional insights into the physical processes, which occurred within the samples to guide future model development.

The prompt diagnostics used include Cygnus radiography to take X-ray pictures of the material, as well as laser-based instruments to measure the surface velocity of the samples. These diagnostics tell experts how much energy has been imparted to the sample and how it is deforming.

Thermos experiments differ from the sub-critical experiments that NNSA also uses in stockpile stewardship. The amount of plutonium and high explosives, for example, is much less in the Thermos experiments and the shape is much different. Additionally, the design of the Thermos experiments allowed for the recovery and laboratory examination of the plutonium after it was shocked.

PU EXPERIMENT: Technicians prepare a dynamic plutonium experiment, named Thermos, at the U1a facility 1,000 feet underground at NNSA's Nevada Test Site. The Thermos experiments are designed to study damage to plutonium under dynamic loading conditions.

NNSA News is published monthly by the Office of Congressional, Intergovernmental and Public Affairs. David A. Campbell, Director. Editors: Victoria Barq, Al Stotts, Julianne Smith, Bryan Wilkes. Design: Barbara L. Courtney. Contributors Include: Chris Burroughs, Sandia Labs; Tim Evans, NNSA HQ; Tom Gunderson, Los Alamos Lab; Todd Hanson, Los Alamos Lab; L. Kim Nguyen, Los Alamos Lab; Norma Restivo, NTS National Security Technologies, LLC; Kevin Roark, Los Alamos Lab; Neal Singer, Sandia Labs; Cody Stotts, WSI/OST; Randy Weidman, NNSA HQ; Gordon Yano, Lawrence Livermore Lab; Steve Wyatt, Y-12 Site Office.