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Advanced Computing Program Enhances NNSA Laboratory Integration, Cooperation

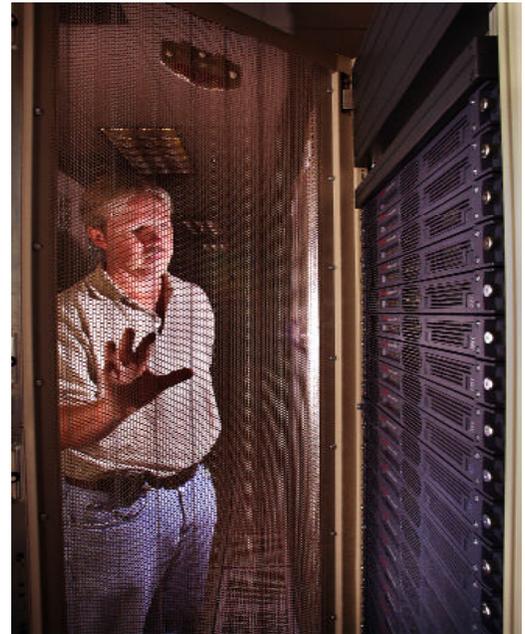
Editor's note: This is the first in a series of feature articles about NNSA's Stockpile Stewardship Program that will run each month in the newsletter.

The Advanced Simulation and Computing (ASCI) initiative addresses a wide spectrum of scientific activity. But in addition to meeting the science-based simulation requirements of the NNSA's nuclear weapons Stockpile Stewardship Program (SSP), the ASCI effort has helped the three weapons laboratories in New Mexico and California to cooperate in unprecedented ways.

Deputy Administrator for Defense Programs Everet Beckner says the programmatic approach to high-performance computing in NNSA has integrated the ASCI staff at Headquarters with the Tri-Lab Executive Committee and teams staffed by specialists at Lawrence Livermore National Laboratory, Los Alamos National Laboratory and Sandia National Laboratories.

"The questions that ASCI investigates on behalf of the SSP span the activities and responsibilities of the three NNSA national laboratories," Beckner says. "Cooperation among these labs is essential to solving SSP problems in an efficient and effective

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TRI-LAB COMPUTING: Carl Leishman examines one of many racks of computers that collectively form the basis of Sandia's Cplant system, the largest Linux cluster in the world.

NNSA Program to Engage Iraqi Scientists

A new program to provide employment opportunities to Iraqi scientists, technicians, and engineers will be initiated by NNSA, Administrator Linton Brooks announced. The program will complement other Bush Administration initiatives that seek to support reconstruction efforts and prevent the proliferation of weapons of mass destruction (WMD) expertise to terrorists or proliferant

states.

The new effort is in cooperation with the Arab Science and Technology Foundation (ASTF) and the Cooperative Monitoring Center at Sandia National Laboratories. The unique partnership will also help rebuild key elements of Iraq's critical infrastructure and develop new Iraqi business opportunities that provide sustainability to Iraqi science and technology.

"This program addresses the critical need to provide significant and meaningful employment opportunities for all scientists in Iraq," Brooks said. "Moreover, it is helping them rebuild Iraqi science and technology infrastructure and reintegrate Iraq into the international science community."

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Advanced Computing Program at Labs

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manner.”

The program creates simulation capabilities through the development of advanced weapons codes and high-performance computing that incorporate high-fidelity scientific models validated against experimental results, past tests, and theory. This includes the means to assess and certify the safety, performance and reliability of nuclear weapons.

“The ASCI program actively addresses stockpile issues by developing and using simulations to

study problems ranging from advanced design and manufacturing processes, to understanding accident scenarios, to weapons aging and to the resolution of significant finding investigations,” says Dimitri Kusnezov of the NNSA Office of Advanced Simulation and Computing. “This spectrum of scientific inquiry demands a balanced system of hardware, software, and computer science solutions.”

All three laboratories participated in the development of ASCI’s current program plan. Guided by the NNSA Office of Research, Development and Simulation, project leaders at all three laboratories have implemented ASCI investigations. They share

ASCI code development, computing, storage, visualization and communication resources in their joint development efforts.

Beckner says ASCI program leaders have significantly reassessed and redefined the program’s major milestones in collaboration with weapon designers, the Directed Stockpile Work community and with the Science Campaigns. He says major accomplishments to date have included the installation of new supercomputers and their use for the first prototype three-dimensional full-system weapons simulations along with resolution of significant finding investigations and the redesign of weapons components.

Krol Named NNSA Administrator For Emergency Operations

NNSA Administrator Linton F. Brooks has named retired Rear Adm. Joseph J. Krol as the associate administrator for emergency operations.

Krol directs the emergency response programs at the NNSA to ensure the Department of Energy can provide a quick and reliable response to nuclear and radiological emergencies in the U.S. and abroad. Krol will report to the NNSA administrator through the deputy undersecretary of energy for counterterrorism.

“I am very pleased with this appointment. Joe has extraordinary technical and managerial skills that will help strengthen the NNSA senior leadership team. His detailed experience in nuclear reactor and nuclear weapons

operations and safety will benefit NNSA greatly,” Brooks said.

Krol has 36 years of continuous

active duty in the U. S. Navy and has expertise in anti-terrorism security, nuclear reactors, and nuclear weapons operations and safety programs.

Before joining NNSA, Krol held several key management positions in the federal government, including the director of the Central Intelligence Agency’s Defense Liaison Division. Additionally, he was commander of Submarine Group Seven in Japan where he directed submarine operations covering more than 40 percent of the earth. Most recently, Krol was deputy director and acting director of operations and plans for the chief of naval operations in Washington, D.C.

Krol graduated from the U. S. Naval Academy with a Bachelor of Science degree in Mechanical and Nuclear Engineering. He is a qualified nuclear engineer.



KROL TOURS NTS: Admiral Joseph Krol, new associate administrator for emergency operations, NNSA, second from left, tours the G-Tunnel Complex on the Nevada Test Site.

DSP Satellite Includes Nuclear Detection Payload

A Defense Support Program (DSP) satellite launched recently from Florida's Cape Canaveral Air Station included sophisticated nuclear test detection sensors from the National Nuclear Security Administration (NNSA). The advanced nuclear detonation detection payload, a primary detection system for nuclear explosions in the upper atmosphere and space, is the satellite's secondary payload.

These space-based sensors, developed by NNSA's Office of Nonproliferation Research and Engineering, are used to monitor the Limited Test Ban Treaty of 1963, and to deter proliferant nations from conducting nuclear tests. NNSA develops and provides a wide variety of technologies to stem the proliferation of weapons of mass destruction. The technologies have been monitoring space and atmospheric nuclear explosions for

over 40 years and are currently secondary payloads on both the DSP and Global Positioning System (GPS) satellites.



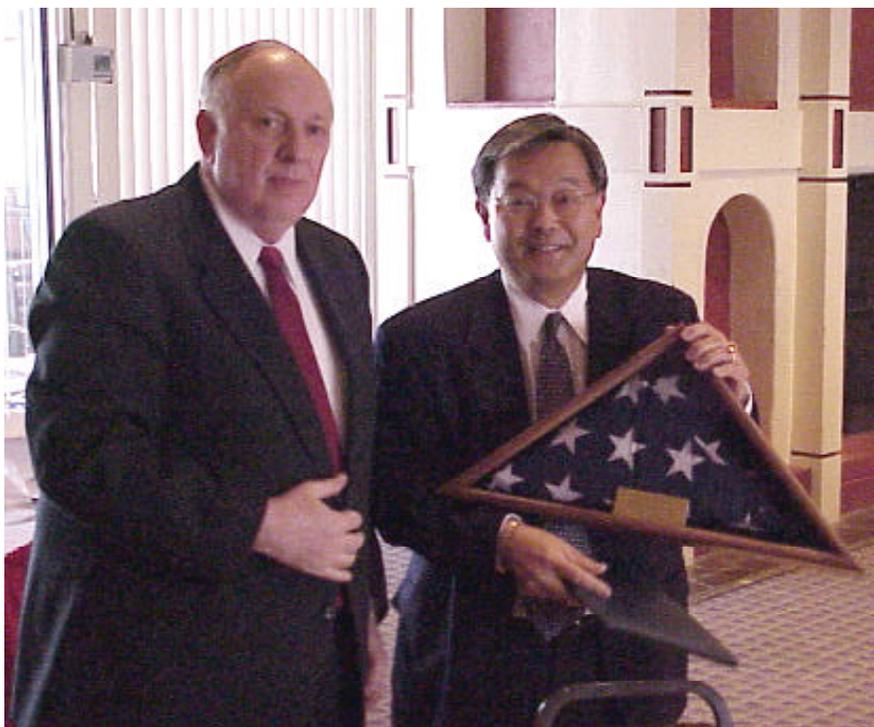
SATELLITE SENTRY: - This artist's rendering shows a Defense Support Program (DSP) satellite in its role as an orbiting sentry.

The U.S. Air Force launched the first DSP satellite on November 6, 1970. The constellation of satellites operates in geosynchronous orbit to provide early warning of missile

launches, space launches and nuclear explosions.

The last DSP satellite, scheduled for launch in 2005, will mark the end of the present nuclear detection sensor package design, but will also carry the demonstration experiment for the next generation of high altitude sensors — the Space and Atmospheric Burst Reporting System (SABRS) — that NNSA is currently developing. Continuing research and development programs have made the sensor

packages smaller and more robust, while greatly increasing the ability to detect clandestine nuclear tests.



JIM HIRAHARA RETIRES: The NNSA Service Center's first manager, Jim Hirahara (right), receives an American flag from Administrator Linton Brooks at a ceremony in Albuquerque. The flag was flown over each of the Service Center's three sites - Albuquerque, Las Vegas and Oakland. Brooks also presented Hirahara with the Secretary's Gold Medal and the NNSA Gold Medal for distinguished service to DOE. Hirahara has a new position with the University of California.

Los Alamos National Laboratory Computer Scientist Honored As Asian American Engineer of the Year

A Los Alamos National Laboratory computer scientist known for his innovations in supercomputing and high-speed networks has been named the 2004 Asian American Engineer of the Year by the Chinese Institute of Engineers/USA.

Wu-chun Feng, leader of the Research and Development in Advanced Network Technology Team in LANL's Computer and Computational Sciences Division, was honored for his many recent research achievements.

Feng leads a wide variety of research projects in high-performance networking and computing, network monitoring and traffic characterization, network protocols, computational and data grids, distributed resource management and cyber security.

Last year he received a prestigious R&D 100 award given by R&D Magazine to the top 100 technology innovations of the year. That award recognized his work on the Linux-based supercomputer dubbed Green

Destiny, an efficient, reliable 240-node supercomputing cluster that occupied a two-by-three-foot area, used about one-tenth the electrical



COMPUTER SCIENTIST HONORED: Wu-chun Feng, Asian American Engineer of the year.

power of comparable supercomputers and never failed during its lifetime. The "phone-booth" supercomputer is part of Los Alamos' Supercomputing in Small Spaces project, whose goal is to build more efficient supercomputers

that consume less power and space, resulting in cheaper total cost of ownership.

"This is a tremendous honor, one that reflects upon the unwavering dedication and invaluable contributions of the talented engineers and scientists with whom I work, as well as the love, understanding and support of my family," Feng said. "I hope the recognition given to my work at Los Alamos by the Chinese Institute of Engineers inspires young Asian-Americans to explore careers in computer science and engineering."

Feng joined Los Alamos in 1998 and quickly established his research reputation with more than 70 journal and conference publications and has given more than 20 invited talks and colloquia around the world. He is a fellow of the Los Alamos Computer Science Institute. He holds a doctorate in computer science from the University of Illinois at Urbana-Champaign.

NNSA Program to Engage Iraqi Scientists

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The program is being implemented by an international partnership of scientists from the ASTF, a pan-Arab non-governmental organization based in the United Arab Emirates that promotes the development of science and technology in the Arab world. Scientists from international organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), as well as NNSA's national laboratories will also participate. The program

complements the State Department's Iraqi International Center for Science and Industry and the work by the Coalition Provisional Authority (CPA). Since July 2003, the CPA has employed and redirected Iraqi scientists through the establishment, funding, and direction of Iraqi Ministries of Science and Technology, Higher Education, Agriculture, Water Resources, and Environment.

The first phase of this long-term effort is the current survey of Iraq's science and technology infrastructure by scientists from the ASTF. Once

the survey is completed, the partners will convene a workshop in the region to bring together representative experts from Iraq, the United States, the international science community, and funding organizations to discuss priorities and options for technical cooperation. Finally, financial contributions from donor countries and funding organizations will be sought to initiate work on several of the highest-priority projects, as well as institute a merit-based nomination and review process for future work.

Tritium Extraction Facility Heads Toward '05 Finish

Construction crews recently finished assembling and leak testing the second furnace for the Savannah River Site Tritium Extraction Facility (TEF). The furnace is one of two that will be used to heat the Tritium Producing Burnable Absorber Rods, which is the key step in extracting tritium gas from the rods.

Tritium is a radioactive form of hydrogen used in the nuclear weapons program. The rods are being irradiated in a Tennessee Valley Authority light water commercial nuclear reactor and will be sent to TEF for tritium extraction.

The furnaces will be installed into modules, currently being installed in the remote cell of the Remote Handling Building (RHB). Once

extracted from the rods, the tritium will be transferred to gloveboxes in the RHB and then to the gloveboxes in the Tritium Processing Building (TPB) where the impurities will be removed. The purified tritium will then be transferred to an existing tritium facility prior to loading into reservoirs for shipment to the Department of Defense.

All nine gloveboxes have been installed in the facility and the temporary openings on the east end of the TPB, used to bring the gloveboxes in the facility, have been closed with concrete. Eight of 78 turnovers have been made and are undergoing startup testing. The physical completion of construction is expected by the end of the second



TEF FURNACE TESTING: Furnace No. 1 being moved to the leak test stand.

quarter of FY05, with approval to begin normal operations forecast for FY07.

Patty Wagner Is New Sandia Site Office Manager

Maintaining the world-class facilities within NNSA and providing employees at those facilities with the tools they need to do their best work has been the goal of new Sandia Site Office (SSO) Manager Patty Wagner in every position she has held within the Department of Energy.

Formerly the Deputy Manager at SSO, she was appointed by Ambassador Brooks as the Manager in January of this year to replace Karen Boardman, who is now Manager of the NNSA Service Center. In her new role, Patty is responsible for overseeing the contract for Sandia National Laboratories (SNL) and ensuring the safe and secure operations of the Department's mission at the laboratories. "I consider myself extremely fortunate to work with

some of the finest talent in NNSA," Patty said. "The entire SSO senior management team are a very talented group of individuals with a broad



SSO MANAGERS: Patty Wagner, manager and Mike McFadden, assistant manager.

depth of experience who also team very well."

While she was SSO deputy manager, Patty was the lead negotiator on the \$2 billion SNL contract, which includes innovative

new contracting language. The new contract provides a model for implementing an operational Contractor Assurance System with an increase in contractor accountability and a shift in federal oversight.

"We are in the first year of the new model contract with Sandia," Patty said. "The first year will mean change for both the contractor and the federal staff, but I am confident that the model contract will be a success."

Patty joined the DOE's Albuquerque Operations Office in January 1997 where she served as the Assistant Manager for Business Operations. In February 2002, she was promoted to the Deputy Manager for Business and Administration. Patty began working for DOE in 1995 as the Chief of Staff at the Rocky Flats Field Office in Golden, Colo.

KCP and Pantex Form Partnership, Improve Performance

Three years ago, Pantex BWXT invited the Kansas City Plant to share best business practices with the goal of improving productivity, quality, delivery performance, and capacity constraints without increasing costs.

Since that time, the Kansas City Plant has worked closely with Pantex employees to make significant improvements, particularly in the areas of pit repackaging, mass properties, quality and root cause analysis, information systems, and knowledge preservation.

“The past few years have seen several opportunities for Pantex and the Kansas City Plant to share information and technical expertise,” said Virgil Hughes, a member of the original group of Kansas City Plant managers who went to Pantex when BWXT was awarded the Pantex maintenance and operation contract.

“Both plants have worked together to improve the weapons complex by leveraging corporate resources and knowledge as it relates to nuclear resources and production,” said Hughes.

The success of the collaboration hasn’t escaped the notice of the National Nuclear Security Administration. The Kansas City Plant’s Six Sigma team received a Defense Program Award of Excellence for its work at Pantex, specifically commending improvements in pit repackaging, evaluation of capacity constraints in mass properties, and improvements in tooling process workflow and efficiency.

Jim Lula, a staff engineer in the Kansas City Plant’s materials engineering organization, went to Pantex not because they were having

problems, but because they needed to capture knowledge before it left the plant.

Lula, a Six Sigma Black Belt, went to Texas to help Pantex employees capture some of their critical processes.

“Pantex is just like us: they go for quality,” said Lula. “They are very exacting about the purity of materials and particle size in their high-explosives formulations.”

Lula examined Pantex’s processes, interviewed experts, studied procedures, and then made extensive process maps. After reviewing initial maps, experts familiar with the processes made suggestions for further refinement.

“The process maps were videotaped, the engineers were interviewed, and we put it all together



BEST BUSINESS PRACTICES: Pantex scientist Tim Quinlin holds the product of the knowledge preservation process – a disk that will help future workers understand the synthesis and formulation of high explosives.

in a knowledge preservation package,” said Lula. The final product includes 57 process maps linked to 195 videos covering the process overview, step-by-step instructions, and interviews with subject matter experts.

As a result of assistance from the Kansas City Plant, Pantex now uses Six Sigma process mapping, as well as the Kansas City Plant web-based delivery system, to capture knowledge for critical process information.

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Sandia Begins Major Test Capabilities Upgrade

New construction is under way at NNSA's Sandia National Laboratories on a \$120 million, five-year program to revitalize the Laboratories' large-scale test capabilities.

The project, known as Test Capabilities Revitalization (TCR), will provide the equipment and associated scientific capabilities to allow Sandia to continue its role in stockpile stewardship, new weapon design, and modeling and simulation science.

New demands on Sandia's test facilities have come along with a major transformation in the U.S. nuclear stockpile now in progress, said Tom Hunter, Sandia's senior vice president for defense programs. Life extension programs and alterations to existing weapons will require testing at the new facilities, he explained.

"TCR is an important investment in meeting the mission of the stockpile stewardship program," said Dr. Kevin Greenaugh, director of NNSA's Office of Stockpile Assessments and Certification. "Modern testing and experiments enabled by TCR, integrated with advance computing supported by computers like Red Storm now under development at Sandia, will inject vigor into the engineering sciences capabilities of Sandia and give new life to the stockpile." (Seattle-based supercomputer manufacturer Cray is teaming with Sandia on Red Storm, which is expected to be up and running this year at a beginning speed of 40 trillion calculations per second.)

Work began on the first of two project phases in February with a groundbreaking ceremony for the Labs' new Thermal Test Complex.

Construction has also begun at the Aerial Cable Site in Sol Se Mete Canyon in the Manzanito Mountains on the east side of Kirtland Air Force Base (KAFB.)

The Thermal Test Complex is designed to be a multi-laboratory, test and office facility in Sandia's Technical Area III south of Albuquerque on KAFB.

This complex provides state-of-the-art thermal testing capabilities for fire environments and system

responses to fire and other thermal conditions. With the ability to perform indoor fire testing, it offers three thermal modes (gas fire, liquid fire, and radiant heat) with systems to accurately control test conditions and analyze the fires. An important feature for the Thermal Test Complex is a state-of-the-art air cleaning system called an electrostatic precipitator.

Sandia's Aerial Cable Site will be revitalized as a part of Phase I to improve capabilities for pull-down and gravity drop tests and simulated flights along a cable. The site features two large cables strung across a narrow canyon, where objects can be hoisted up to 600 feet in the air and

dropped. Pull-down tests are conducted by connecting the test object to a rocket on a rail. The rocket is fired into a catch basin and



THERMAL TEST COMPLEX: Architectural drawing of 7-story FLAME Test Cell at the Thermal Test Complex, now under

the test object is pulled to the ground rapidly, at speeds up to 1,100 feet per second, using an arrangement of pulleys and cables.

The revitalization will include new cable systems, anchors, pulleys, control winches, and a rocket sled catch box. Just beyond the canyon, a new control building will house control room equipment, storage rooms, and assembly areas for test objects.

**Got an article for
the NNSA
Newsletter?**
Submit it to AStotts@doeal.gov

KCP Navigation System Aids Sophisticated Target Practice

It's sort of like a clay pigeon, only more expensive, and with cool features. The roll-stabilized inertial navigation system (INS) being built at the Kansas City Plant is a sophisticated system that is designed to be attached to a target missile and provide data about the missile's position. If the data is accurate, the result of the exercise is the destruction of the target and the INS. It's an expensive exercise, but one that is critical to the safety and accuracy of the nation's defense systems.

The INS is about the size of a paint can – seven and one-half inches tall and four inches in diameter. It's an integral component of the telemetry system that is attached to a missile or another vehicle and transmits data about the vehicle's acceleration and attitude to engineers on the ground. The idea is to track and control the

dynamics of the target vehicle during flight.

When attached to target vehicles for tests of weapons systems, the INS records data about the position of the target vehicle until both are destroyed mid-air by a missile.

The Kansas City Plant began working on the units more than a year ago when officials at Sandia National Laboratories approached plant engineers about the project.

"We have the capability, attention to detail, and discipline to build their product," said staff engineer John Bellah, project leader of INS efforts at the Kansas City Plant. "We're applying strategies we've learned from our own production processes and using them for this nontraditional business."

Another of the selling points was the strong definition drawing control

system. "Many other businesses use drawings, but not many control them like we do here," said Bellah.

According to senior configuration management specialist Marcia Penyock, "We control the drawings used to build parts. Employees don't make any changes without authorization, so the customer knows that they'll get exactly what they ask for."

"Sandia became convinced that, as the design evolved, we would need an accurate definition system to accommodate changes and special needs," said Bellah.

The Kansas City Plant builds the units and does the preliminary testing. The finished units are sent to Sandia for final testing. The INS units are ultimately used to support an Army contract.

Sandia Receives Pollution Prevention Best in Class Awards

Sandia National Laboratories/New Mexico has received three NNSA Pollution Prevention Environmental Stewardship Awards from Administrator Linton Brooks. The Best in Class awards were in three categories: Sustainable Design Integrated Educational Series, Continuous Improvement for Construction Purchasing, and Construction Waste Recycling.

"These awards signify exceptional contributions to the Department's efforts in ensuring that we continue to perform our operations with the utmost respect for the environment," Brooks said at a recent ceremony in Albuquerque. "I was extremely impressed with the tremendous effort and ingenuity that went into the work by these teams and individuals, and the partnerships they formed to produce such outstanding results."

In addition to the recipients, Sandia Site Office Manager Patty Wagner, Labs Director Paul Robinson, and Deputy Director Joan Woodard were on hand for the ceremony.



POLLUTION PREVENTERS: One of the three award-winning teams.