

Arms control and nonproliferation



PAYLOAD PAYOFF — Sandia engineers Chuck Looney (left) and Dennis Gutierrez make last-minute checks of the solar arrays on the Multispectral Thermal Imager (MTI) satellite at the Payload Processing Facility at Vandenberg Air Force Base, Calif., prior to encapsulating the satellite in preparation for launch that took place on March 12, 2000. Half of the satellite's protective fairing (rocket nose cone) is visible in the background with its internal (black) thermal-acoustic blankets. (Photo by Randy Montoya)

On March 12, 2000, the USAF launched the **Multispectral Thermal Imager (MTI)** satellite into polar orbit aboard an Orbital Sciences Taurus rocket. MTI is a Sandia-led, multilaboratory R&D project sponsored by DOE's Office of Nonproliferation and National Security. Its objective is to develop, demonstrate, and evaluate multispectral and thermal imaging and related technologies for a broad range of national security civilian applications. **Brian Brock, bcbrock@sandia.gov**

Mayak Production Association is a major Russian nuclear enterprise involving numerous plants that process and store large quantities (estimated to be more than 100 metric tons) of plutonium and uranium for both weapon and civilian uses. Under the sponsorship of the DOE Material Protection, Control, and Accounting (MPC&A) Program, the Mayak Project has provided an initial design for large **steel-clad, steel-reinforced concrete blocks to cover canisters of plutonium dioxide** in order to increase the time required for a thief to gain access to the canisters. An agreement was recently signed that establishes the foundation for initiation of security upgrades at another of Mayak's



STEEL-CLAD reinforced concrete blocks are being placed on top of canisters of plutonium dioxide in storage to make it harder for a thief to access the materials.



MTI SATELLITE image showing the San Rafael Bridge north of Oakland and San Francisco, Calif. Vegetation shows up as bright red.

plants in which extremely large quantities of weapons grade plutonium and uranium are processed and stored. (5300, 5800) **Jim Chapek, jfchape@sandia.gov**

We have designed, fabricated, and demonstrated prototypes of two **portable chemical analysis systems** tailored to the rapid detection and analysis of toxic agents that might be released during a terrorist attack. Extensive testing of these prototypes with targeted agents (one for chemical warfare agents and one for biotoxins) has demonstrated that our devices can detect specific agents with extremely high sensitivity in very short times. Furthermore, our tests have shown that these systems are not affected by common chemicals that could potentially serve as interferences. (1700, 8100, 8300)

Duane Lindner, dllindn@sandia.gov

The Advanced Modular Tag (AMT) is a miniature, LPI/LPD (Low Probability of Intercept/Low Probability of Detection) **communicator and tracking device** intended for use by special operations and other DoD forces. This work is funded by the Air Force Space Warfare Center; and, Centers 5700 and 2300 have teamed with Lockheed Martin in this development. Recently, the AMT successfully passed a

critical series of laboratory and field tests required for full certification and use with US assets. (2300, 5700) **Michael Murphy, mbmurph@sandia.gov**

Sandia's best friend may be the newly developed Hound™ — that is, if you need contra-band detection capabilities. The Hound™ is a **portable sampling/preconcentration system** fitted to a commercial portable detector to

improve sensitive and sampling efficiency. This portable sampling/preconcentrator system is a direct outgrowth technology from the explosives detection portal (EDP) developed by Sandia for the Federal Aviation Administration. The EDP and the Hound™ are capable of detecting vanishingly (parts per trillion) faint odors of explosives and other chemicals. (5800) **Kevin Linker, kllinke@sandia.gov**



SAMPLING on the Chirchik River in Uzbekistan are, from left, Viktor Poznyak, Kazakhstan; Alexandra Inoyatov, Uzbekistan; Bajgabyl Tolongutov, Kyrgyzstan; Raisa Radyuk, Uzbekistan; Sandian Dave Barber; Valentina Alekhina, Kyrgyzstan; and Djamshed Kamalov, Tajikistan.

The Cooperative Monitoring Center is collaborating with nuclear physics institutes in Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan in a **waterborne radionuclide monitoring experiment** on the major rivers in Central Asia. Since the breakup of the Soviet Union, these countries have been pursuing independent courses, and cooperation on any issue has been extremely difficult. These republics contributed greatly to the Soviet nuclear weapons program, from uranium mining and processing to nuclear weapons testing. (5300) **Dave Barber, dsbarbe@sandia.gov**

DOE's AURA (Advanced UV Remote-Sensing Applications) program completed a **successful engineering flight test** deployment to Dugway Proving Ground, Utah, last October. The AURA payload, an advanced ultraviolet laser induced fluorescence lidar, was installed in the Altus UAV (Unmanned Aerospace Vehicle) and completed six successful flights. All science goals were met or exceeded. A second flight test deployment is set

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Microelectronics

First Solid State Ultraviolet Vertical Cavity Surface Emitting Laser (UV-VCSEL): Sandians and researchers at Brown University have used the results of *in situ* stress studies to design an AlGaIn/GaN distributed Bragg reflector. This reflector enabled the first **demonstration of an InGaIn UV-VCSEL**. These lasers will be part of a revolution in white lighting where current lighting will be replaced with solid state lighting as envisioned in the National Solid State Lighting Initiative. The improved efficiency of solid state lighting will result in a huge energy savings and pollution reduction. (1100) *Robert Biefeld, rmbiefe@sandia.gov*

Sandia researchers, with industry partners Cielo, Inc., have developed the first **1.3-micron electrically pumped vertical cavity surface emitting laser (VCSEL)** grown on gallium arsenide. The 1.3-micron wavelength, which is optimal for ultra-high bandwidth data communication over glass fiber optics, is also transparent to silicon, allowing considerable flexibility in incorporating such a photonic device with silicon microsystem structures. (1700, 1100) *Peter Esherick, esheric@sandia.gov*



SANDIA SCIENTIST Jung Han adjusts laser pumping on a prototype ultraviolet VCSEL surface. (Photo by Randy Montoya)

Arms control

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for September 2001. The September test will represent the first demonstration of an operational lidar for the detection of WMD proliferation effluents. (Sandia centers that support the AURA program include 1100, 2300, 5700, 6100, 8100, 8300, 8400, 8900, and 15400.) *Al Lang, alang@sandia.gov*

US/Russian Arms reduction treaties require verification that nuclear materials from dismantled weapons are not returned to weapons use. The Trilateral Initiative of the United States, Russian Federation, and International Atomic Energy Agency (IAEA) is developing a **model verification agreement** and exploring verification technologies. Sandia provides a senior technical advisor and leads a group of technical experts for the US delegation to develop inventory monitoring systems and approaches for verification that are acceptable to all parties. (5300, 5800, 6500) *Dennis Manga, dlmanga@sandia.gov*

Mission Analysis and Simulation Dept. personnel, using the Sandia Data Analysis and Display System, performed detailed mathematical and statistical analyses of the more than 20,000 sensor events collected during the **Nuclear Detonation Detection System Characterization Test** sponsored by the Air Force Space and Missile Systems Center. Radio frequency illumination of the electromagnetic pulse sensors onboard Global Positioning System satellites was accomplished using the Stanford Research Institute pulser located at Algonquinn Radio Observatory in Ontario, Canada. A comprehensive report was completed in August 2000. (6500) *Bill Richard, bdricha@sandia.gov*

Sandia delivered **Release 4.0 of the Nuclear Explosion Monitoring Knowledge Base** to the US National Data Center (US NDC). This Knowledge Base improves the ability of the US NDC to detect, locate, and identify clandestine nuclear tests. It does this by providing detailed knowledge of the earth's structure and signal propagation characteristics developed at DOE's national labs.

Sandia-developed information management systems, applications interfaces, and user interfaces integrate the Knowledge Base with the 24-hour-a-day operations at the NDC. (6500, 6100, 5700) *Ralph Keyser, rgkeyse@sandia.gov*

India and Pakistan have come together at the Cooperative Monitoring Center (CMC) to collaborate on issues of common regional concern. A CMC-sponsored water quality project shared data among India, Pakistan, Nepal, Bangladesh, and Sri Lanka. Workshops at CMC and overseas were conducted with the Department of State, Stanford University, and the Regional Center for Strategic Studies on cooperative monitoring to enhance regional security. Visiting scholars from India, Pakistan, and the US published papers on South Asian nuclear doctrines and agreements, potential for regional naval cooperation, and border security. (5300) *Kent Biringner, klbirin@sandia.gov*



CHRIS CHERRY, left, Sandia's world-recognized bomb-disablement expert, demonstrates render-safe technology during last year's Operation: America training workshop for bomb squads from across the US. The 2000 program was held in San Diego and was sponsored by the National Institute of Justice.

The first in a series of **Operation: America training workshops for bomb squads** was held in San Diego, Calif., Sept. 18-22. The program focuses on advanced disablement technologies to render-safe complex terrorist type devices. Several more five-day workshops are planned, each hosted by a different US city and involving bomb techs from

Environmental remediation

Under contract to DOE Nevada, we completed a Performance Assessment (PA) for **disposal of transuranic wastes** in a Greater Confinement Disposal (GCD) configuration at the Nevada Test Site (NTS). The assessment documents almost 10 years of site studies and system characterization; development and evaluation of conceptual and mathematical models and ranges of defensible input parameters; and final demonstration of compliance with Environmental Protection Agency standards. The PA easily demonstrated protection of humans and the environment, and that GCD is an ideal system for isolating radioactive wastes in arid settings such as the NTS (6100, 6800). *Doug Brosseau, dabross@sandia.gov*

Sandia's Solid Waste Transfer Facility teamed with Kirtland AFB to implement a **base-wide residential recycling center** which achieved DoD recycling goals and national recognition by winning the Air Force Materiel Command "Ronald Yates Award for Team Excellence." Materials collected at the recycling center include plastic, aluminum, new paper, cardboard, tin, and glass. Further teaming efforts now include pick-up of Kirtland's commercial cardboard, roll-off truck services, and joint use of equipment. (7100) *Gabe King, ggking@sandia.gov*

the neighboring region. The San Diego workshop was hosted by the San Diego County Sheriffs Office and the US Navy and taught primarily by Sandians. The Operation: America series is sponsored by the National Institute of Justice. (5900) *Chris Cherry, crcherr@sandia.gov*

Mission Analysis and Simulation Dept. personnel developed an **improved method for evaluating the performance** of an inter-satellite communications system used by the constellation of Global Positioning System (GPS) satellites. The method, while collecting large amounts of data without significantly impacting either space or ground operations, provided new insights into possible error sources. This in turn led to the development of new error reduction techniques, and subsequently influenced the design of future GPS satellites. (2600, 5700, 6500) *Bill Richard, bdricha@sandia.gov*

Sandia has completed two projects demonstrating technologies vital to **protection of major US facilities** against chemical and biological agent attacks. One project has deployed chemical agent detectors and supporting information systems into a testbed in the Washington, D.C., subway system to provide operational data that addresses the long-term reliability and false alarm characteristics of detection systems. A second project has focused on the release of tracers in the San Francisco International Airport to characterize attacks and to evaluate the potential of air handler responses to mitigate effects. Both projects are sponsored by the DOE Chemical and Biological National Security Program. (8100, 2200, 8900, 6400, 6200) *Larry Brandt, lbrandt@sandia.gov*

A Chemical Defense Assessment Team was formed at the direction of Gen. Eugene Habiger to **study defenses against the possible use of lethal chemical agents** to attack the people guarding SNM (Special Nuclear Material) at DOE sites. This Sandia-led team assessed three of the most critical sites this past year and wrote, with the aid of experts from Sandia and DoD's Edgewood Chemical Biological Command, A Guide to Defending SNM Facilities Against Chemical Attacks. (8100, 5800, 9100) *John Vitko, jvitko@sandia.gov*

Emerging threats



HOPPER co-developer Barry Spletzer shows how high the new hoppers can go. This one leaps 10-20 feet high on each jump. (Photo by Randy Montoya)

Reliable, autonomous mobility in difficult environments has previously eluded robotics engineers. Intelligent System Sensors & Controls Dept. 15211's DARPA-funded work developed a hopping machine that **may soon give robots unprecedented mobility** for exploring other planets, gathering war-fighting intelligence, and assisting police during standoff or surveillance operations. Most mobile robots are designed to steer directly to a spot and require expensive and complicated control systems. Over long distances you don't need as much precision, so semi-random mobility is sufficient for many applications. *Jerry Langheim, grlangh@sandia.gov*

Sandia-developed Rapid Terrain Visualization (RTV) Interferometric Synthetic Aperture Radar (IFSAR) is a **revolutionary terrain-mapping radar** capable of producing terrain elevation maps with height accuracies of 0.5 m. The system provides the Army a two-hours-to-data mapping capability for regions of conflict and enables battlefield visualization. The system solves three key problems in interferometric mapping: 1) timeliness of data through real-time processing, 2) high-accuracy digital-elevation maps through innovative multipath reduction techniques, and 3) the elimination of phase unwrapping through multiple antenna baselines. RTV is the first program to demonstrate these capabilities. (2300, 5900). *Gene Kallenbach, gakalle@sandia.gov*

Gathering and transmitting measurements during explosive events is a difficult task requiring a broad radio frequency bandwidth. We successfully flight-tested a 33 megabits per second (Mbps), 16-symbol Quadrature Amplitude Modulation (QAM) High Explosive Radio Telemetry (HERT) that is designed to **collect and transmit data during a high explosive detonation**. The primary benefit of QAM is bandwidth reduction: To transmit a 33 Mbps rate, this system requires 10 MHz bandwidth compared to over 35 MHz using conventional telemetry. (2600, 8400) *John Moser, jcmoser@sandia.gov*

The first **Explosives Destruction System (EDS)** unit designed, fabricated, and quality-tested by Sandia for the US Army Non-Stockpile Chemical Materiel program closed out a campaign of engineering development tests carried out at the Defence Evaluation and Research Agency (DERA) facility in Porton Down, England. World War I vintage mortar shells and artillery projectiles (7 filled with phosgene and 12 with mustard) were destroyed, as was a container filled with more than a pound of Sarin nerve agent. The chemical agents were consistently destroyed below detectable limits. (8100, 15300, 8700) *Al McDonald, amcdona@sandia.gov*

An advanced diagnostic tool, the **line-imaging optically recording velocity interferometer system (Line-ORVIS)**, has been developed and demonstrated, under LDRD funding, to quantify material dynamic response at unprecedented temporal and spatial resolution. This diagnostic provides 1-D spatially- and temporally-resolved material response and/or provides single-time 2-D response data. Line-Orvis has been applied in collaborative computational "discovery" studies of energetic material mechanical response at the meso-scale, has provided data critical to stockpile materials, including PZT, ALOX, and HMX, and is a primary diagnostic for Z-pinch physics studies. (9100, 2500, 1600) *Arthur Ratzel, acratze@sandia.gov*

Following two years of planning and coordination, a series of chem/bio simulant release tests were



ONLY A TEST — Chem/Bio Simulant Release Test in SFO Boarding Area G. The simulated chem/bio agents were released to experimentally characterize the response of the facility to a terrorist attack with these weapons of mass destruction. The tests were designed to demonstrate that DOE technologies can be successfully used to address the emerging chem/bio threat to critical national infrastructure.

Warbirds



SYSTEMS RELIABILITY DEPT. 6411's primary efforts during FY00 focused on the broad area of sustainment and readiness of weapon systems. Major programs were established with: Lockheed Martin in Support Enterprise Modeling and health monitoring for the Joint Strike Fighter and the F-16; Raytheon in Service Life Extension for the Advanced Cruise Missile and predictive reliability/maintenance for the Future Combat System; DARPA/Army in predictive reliability/maintenance and health monitoring for the Joint Virtual Battlespace; the Air Force in supply chain management and spares optimization for the F-22; and the Army in predictive reliability and retrofit optimization for the Apache helicopter. (6400) *Jerry Langheim, grlangh@sandia.gov*

performed at the San Francisco International Airport. The **simulated chem/bio agents** were released to experimentally characterize the response of the facility to a terrorist attack with these weapons of mass destruction. The experiments were a major milestone under the PROTECT Domestic Demonstration and Application Program funded by DOE, which is intended to demonstrate that DOE technologies can be successfully used to address the emerging chem/bio threat to critical national infrastructure. (9100, 8100, 6400, 6200) *Richard Griffith, rogri@sandia.gov*



ROBOTIC VEHICLE WITH FUEL CELL

We integrated and tested a **fuel cell power system on a robotic vehicle**, an industry first. The fuel cell combines hydrogen and oxygen at low temperature without combustion to produce electricity at high efficiency, potentially offering much greater operational range than batteries presently used. In collaboration with the Fuel Cell Propulsion Institute, Sandia combined an H-Power Corporation stack with a hydride bed hydrogen storage unit developed at Sandia/California. (15200, 6200) *Jerry Langheim, grlangh@sandia.gov*

In July 2000, Sandia completed work on two royalty-bearing license agreements to **commercialize Sandia's decontamination formulation** for chemical and biological weapons agents. The formulation can be deployed in various ways: as a foam, fog, spray, mist, or liquid. It is non-toxic to humans. The two separate licensee companies obtained non-exclusive rights under the agreements that allow them to supply emergency responders with technology that can mitigate the effects of a chemical or biological attack. Part of the royalty and fee revenues will support future Labs R&D endeavors. (11500) *Russell Elliott, rusty@sandia.gov*

The **Laser Dynamic Range Imager (LDRI)** sensor was developed for NASA/Johnson Spaceflight Center (JSC), which provided the funding for this project. The LDRI sensor, capable of capturing 3-D images at a rate of 7.5 Hz, was delivered to Kennedy (Continued on next page)



Computing

Cplant™, short for Computational Plant, is now the **largest Linux cluster in the world** with nearly 2,000 Compaq Alpha nodes. The Cplant team has developed a flexible architecture to accommodate further additions, and a testing strategy to ensure a production quality environment for the users. In FY01, Cplant is to be a tri-Lab computing resource, extending its access to sister labs and to the open community. Cplant clusters have already reached usage levels up to 90 percent. (9200, 9300) *Neil Pundit, ndpundi@sandia.gov*

SecureNet Videoconferencing in Production: A new, more reliable classified videoconferencing capability has gone into production at Sandia/California and Sandia/New Mexico. The system enables customers to use classified videoconferencing whenever they wish, without the need to schedule through DOE/HQ. This videoconferencing capability uses the SecureNet network infrastructure to transport video and audio between sites. Interest in this new classified videoconferencing system is spreading quickly throughout DOE. (8900, 9300, 2100) *Brian Chamberlain, bgchamb@sandia.gov*

As users on the Sandia Restricted Network (SRN) have been keenly aware, network outages over the past year or so have interrupted business at very inopportune times. A year ago, network reliability dropped below 99 percent, which was unacceptable. A Network Reliability Task Force was assembled to analyze and address the problem. In the first quarter of FY00, reliability was

99.3 percent, 99.5 percent the 2nd quarter, 99.8 percent the 3rd quarter, and **99.9 percent the 4th quarter**. The team continues to work toward improved reliability and availability, while supporting the dynamics of advanced systems that support supercomputing users and MESA. *Pat Manke, plmanke@sandia.gov*

The corporate need for information management, retention, and collaboration tools on both the restricted and classified networks was accomplished with the implementation of Web Fileshare (WFS). More than 16,000 files have been contributed by users at the Labs and 2,800 searches are run each month. This content management system provides a **common set of tools to effectively manage information** through its life cycle — from creation to archiving. It can be integrated with project Web sites to assist in accessing collections of information. (9300, 9500, 9600) *Beth Moser, ecmoser@sandia.gov*
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CHECKING OUT CPLANT™ — Carl Leishman (14111) examines one of many racks of computers that, when clustered together, form the basis of Sandia's CPlant system, the largest Linux cluster in the world, with nearly 2,000 Compaq Alpha nodes.
(Photo by Randy Montoya)

Emerging threats

(Continued from preceding page)

Spaceflight Center in September and installed on the Endeavor space shuttle. A critical demonstration of the sensor was completed successfully during a November Shuttle mission. (2300, 5700, 9100, 14000, 15000) *Jerry Langheim, grlangh@sandia.gov*

The Short-Pulse Laser (SPL) Program made hallmark scientific discoveries in FY00. World's-first laser techniques for creation, sustainment, and control of 50 femtosecond "optical bullets" were developed, world record propagation distances were achieved, and new phenomenologies were demonstrated in the lab and in field trials. These successes secured a combined DoD/DOE FY01 funding increase of roughly 50 percent over FY00. The SPL team includes nationally recognized experts from Center 15300. Sandians from other divisions contribute to the program's success on an as-needed basis. (15300) *Jerry Langheim, grlangh@sandia.gov*

The Information Design Assurance Red Team (IDART) has continued to analyze advanced information systems for DARPA with the intent to help designers rethink traditional system design approaches. Major accomplishments in FY00

include the **definition and characterization of adversary models** that range in sophistication from novice to foreign intelligence and the development of a training curriculum in the IDART methodology. The team trained new "Red Teamers" at Sandia and DARPA to analyze systems from an adversarial point of view to demonstrate how a cyber terrorist, for instance, might exploit vulnerabilities. (6500, 2600, 5800, 9300) *Jerry Langheim, grlangh@sandia.gov*



COMIN' AT YOU — Sandia's Information Design Assurance Red Team, good guys playing bad guys, seeks out weaknesses in computer systems. Red Team members shown are, at keyboard, David Duggan (6236), from left in the background, Michael Eckley (2662), Ruth Duggan, Ray Parks, Julie Bouchard (all 6237), and Dave Farrell (5932).
(Photo by Randy Montoya)

Manufacturing & production

The **qualification of the MC4380 Neutron Generator** was completed for the W76-0 and a major corporate milestone was met. This project showed for the first time that we can design and qualify a component to survive strategic radiation environments without underground testing. We also established a new Neutron Generator Production Facility and showed we can reliably produce neutron generators for the stockpile. This project was accomplished through the teamwork of organizations throughout Sandia. (2100, 1800, 2500, 2900, 3500, 4600, 6200, 6400, 7100, 8400, 8500, 8900, 9100, 9200, 9500, 9800, 10200, 12300, 14000, 15300) *Pat Sena, pasena@sandia.gov*

The W76 Recertification Program was put on hold for six months to assist in the October 1999 deadline for the MC4380 Generator production. After coming back on line with full production of the recertification program and with reinstated ship requirements, the program picked up where it left off. We are now at **63 consecutive successful Quality Assurance Inspection Process (QAIP)** submittals to the DOE. The program continues to meet 100 percent of ship requirements to the Navy. (9100, 2500, 141001, 14400, 10200) *Norman Schwentor, njschwe@sandia.gov*

A process has been researched and developed whereby **micron-scale tools can be fabricated using a Focused Ion Beam**. These tools may then be used on precision machining equipment to make micron-scale features. Previously, miniature machining techniques could only get down to the 50-100 microns scale. It is now possible to directly fabricate micron-scale components out of traditional design materials such as stainless steel, alloys, and ceramics. We expect this technology to have application in microactuation, microanalysis, medicine, and component fabrication. (14100) *David Adams, dpadams@sandia.gov*

The Manufacturing Enterprise (ME) (14181/14186) was awarded a **Certificate of Registration to ISO 9002 Quality Systems** on April 28, 2000. The ME is the first organization to achieve this recognition at Sandia National Laboratories and a first for the DOE weapons labs. It was a process that began three years ago with a vision to position the ME for the future. Accomplishing this task required major changes in our business processes, involved all aspects of our business and all of our people. (14100, 12300) *Paul McKey, pcmkey@sandia.gov*

Energy and critical infrastructure

After 10 years of planning, design, and construction, Sandia overpressurized a 1:4-scale model of a Japanese nuclear reactor pre-stressed concrete containment vessel to failure. The model, tested for the US Nuclear Regulatory Commission and Japan's Nuclear Power Electric Company, initially leaked at 2.5 times the design pressure (Pd) before reaching a maximum pressure of 3.3 Pd. The data from almost 1,500 sensors will be used by an international team of experts as a benchmark for structural analysis codes and will aid the development of new state-of-the-art accident response models. (6400) *Mike Hessheimer, mhessh@sandia.gov*

The safety of high-power lithium-ion batteries, which will be used in hybrid electric vehicles and the NASA Space Shuttle, is of key importance. Thermal runaway in lithium-ion cells, if not controlled, can have serious safety implications. Our calorimetric studies have identified the mechanism of thermal runaway under abuse conditions. This improved understanding of the reaction sequence will enable researchers to investigate the chemical mechanisms responsible for thermal abuse intolerance, mitigate these effects, and substantially improve the operational safety of batteries for these applications. (2500, 1800.) *Dan Doughty, dhdough@sandia.gov*

Risk Informed Regulation: Many existing regulations governing design and operation of nuclear power plants in the US do not contribute to safety and reliability, which has resulted in unnecessary burden to plant operators and regulators. The Nuclear Regulatory Commission is using risk-information to identify alternatives to



QUARTER-SCALE prestressed concrete containment vessel, overpressurized to failure as part of a test conducted by Sandia for the US Nuclear Regulatory Commission and Japanese nuclear power industry. (Photo by Randy Montoya)

existing regulations. The first step established a risk-informed framework for generating alternative regulations. The framework ensures that new regulations protect public health and safety by providing defense-in-depth measures that address the prevention and mitigation of risk-significant accidents. (6400) *Jeff LaChance, jllacha@sandia.gov*

a robust cyber security architecture that has withstood the test of numerous audits and reviews. Viruses, various Internet attacks, attempted intrusions, and unauthorized access are subject to rigorous scrutiny and rapidly adjudicated when detected. On-line procedures, rapid response teams, and a sophisticated cyber architecture have created a state-of-art system designed to provide Sandia an effective cyber security posture. (9300, 9600) *R. Michael Cahoon, rmc@sandia.gov*

The Scalable Rendering Team developed a high-performance computer graphics rendering system. The large ASCI (Accelerated Strategic Computing Initiative) supercomputers generate datasets exceeding the capability of the largest computer graphics systems. The team used \$350 PC graphics cards to build a scalable rendering system. Recent results, using a 64-node graphics cluster, demonstrated rendering 225 million polygons/sec. This is 100 times faster than the best graphics pipe available on the production ASCI visualization servers. This technology is a key capability for the ASCI program. (9200). *Phil Heermann, pdheerm@sandia.gov*

The Virtual Node Operating System (VNOS) Team extended the Cougar OS to enable user applications to transparently access compute coprocessors on Sandia's ASCI Red teraflops supercomputer. This work was driven by the needs of the Tflops user community for more computational throughput and by severe schedule constraints imposed by Sandia's support contract with Intel. The team developed and delivered the VNOS capability in six months, while meeting all of Intel's stringent testing and evaluation requirements for the OS. The Virtual Node OS provides the ASCI Red user community with the equivalent of many thousands of hours of additional Tflops computer time, worth tens of millions of dollars, over the four years of the machine's expected remaining life cycle. This is a high payoff for a project that cost less than \$500,000. (9200) *Robert Benner, rebenne@cs.sandia.gov*

Computing

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The Sandia Classified Network (SCN) re-emerged as an enhanced capability providing Sandia engineers and scientists the requested functionality and tailored security to accomplish their critical mission work. The solution creatively featured the flexibility of Web technologies interwoven with unique need-to-know security structures. This achievement marks a major step in the alignment of IIS activities with major Sandia program focus. (IIS, 8900, 2900, 9800, 9300) *William Swartz, wdswart@sandia.gov*

To increase user access and efficiency, more than 1,000 journals are now provided electronically to your desktop through the Technical Library's full text, electronic delivery of information. The Engineering Index, SciSearch, Social SciSearch, and INSPEC are examples of our subject-specific indexes, and electronic indexes are linked directly to full-text articles. From the Library's web page you can also access electronic reference tools, like the CRC Handbook of Chemistry and Physics. (9600) *Lynn Kaczor, lmkaczo@sandia.gov*

The cost of desktop computing support at Sandia reached a new low of \$2,200 annually per customer in FY00 while adding several new services and achieving increased customer satisfaction (a new high of 8.8 on a scale of 10). This is a 31 percent reduction from 1994's cost of \$3,200 when the CSUs were first formed. The reduction is the result of process and technology improvements implemented by Computer Support Units, Technology Development, and the Corporate Computing Help Desk. *Charles Shirley, cshirle@sandia.gov*

Agile intrusion detection processes, new firewall management procedures, network scanning, switched high-speed networks, and the Sandia Common Operating Environment have produced

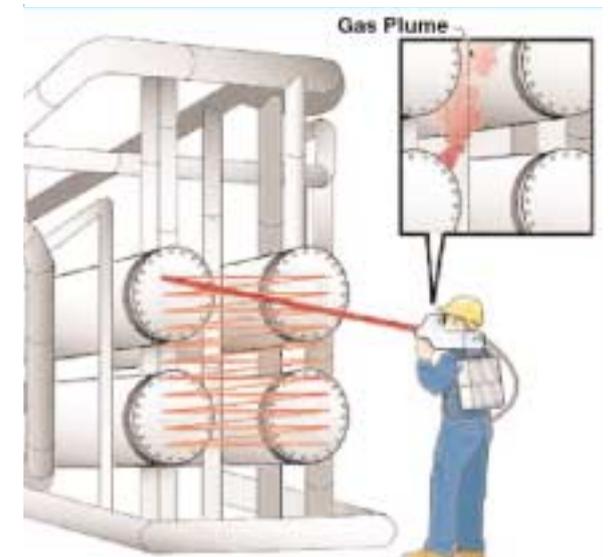
Severe Accident Analysis: Department 6415 recently released version 1.8.5 of the MELCOR code, a software product developed for the NRC embodying more than 20 years of research into severe accident behavior. MELCOR models the progression of a severe accident in a nuclear power plant and potential release of fission products from the site. A significant advance over previous MELCOR releases, version 1.8.5 was distributed to more than 40 foreign and domestic users for application to plant safety and licensing studies around the world. (6400) *Randy Gauntt, rgaunt@sandia.gov*

Sandia fire safety research contributes to safer nuclear power plants and continues to receive industry and customer praise. Notable accomplishments this year under Nuclear Regulatory Commission-sponsored programs include: assessing the impact of fire-induced cable faults on power, control, and instrument circuits; review of worldwide nuclear plant fire events; and plant fire safety inspections. These efforts are supporting development of risk-informed regulatory standards and policy designed to maintain high levels of safety while eliminating requirements marginal to risk. (6400). *Steve Nowlen, spnowle@sandia.gov*

Over the past two years, we have conducted an extremely aggressive Sandia-led project to develop, integrate, and test a state-of-the-art dish/Stirling solar power generation system. We pulled together the "best-of-the-best" advanced technologies, and in November 1999, demonstrated unattended operation of the prototype system. The system has met all of its performance objectives and demonstrated to DOE that Sandia is second to none in the integration of solar thermal systems. We will field a second-generation system on an Indian reservation in the Southwest next year. (6200) *Richard B. Diver, rbdiver@sandia.gov*

The 2001 American Physical Society Herbert P. Broida Prize has been awarded to David W. Chandler, Sandia National Laboratories, and Paul L. Houston, Cornell University, "for their critical contributions to the investigation of vibrationally and rotationally resolved molecular photodissociation and reaction dynamics, in particular for the invention and development of the photofragment ion imaging method." Ion imaging enables studies of the dynamics of photodissociation processes with a degree of detail unmatched by any other method. This technique has been adopted by laboratories worldwide since the first demonstration in Dave's lab in 1986. (8300) *John Goldsmith, jgold@sandia.gov*

Each year US industries spend enormous sums (\$1 million/yr at a typical oil refinery) combatting gas leaks. To simplify leak detection, Sandia has developed a portable instrument that makes video movies of gas plumes. An infrared laser illuminates the scene and the gas becomes (Continued on next page)



USING THIS Sandia-developed portable instrument, an infrared laser illuminates the scene and the gas leak becomes "visible" by absorbing the laser light.

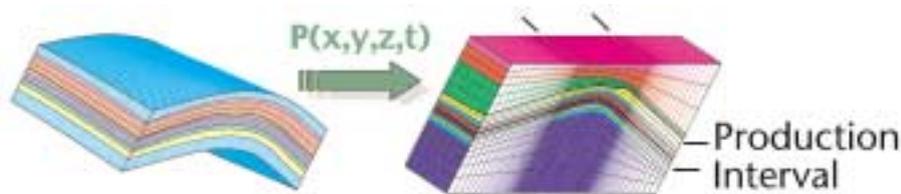


Energy/ critical infrastructure

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“visible” by absorbing the laser light. The small size was enabled using newly developed laser materials and a high power fiber amplifier. The technology will be tested at a refinery in April and is being evaluated by the EPA. (8300)
Tom Kulp, tjulp@sandia.gov

New Technique Reduces Well Failure Rate at California Diatomite Oil Fields: Rock compaction resulting from oil production can cause severe bore-hole damage, sometimes resulting in expensive well abandonment and replacement drilling. Sandia scientists, with funding from DOE, Chevron, and Aera Energy, developed a **methodology for understanding the failure potential** of wells in diatomite reservoirs. The approach used 3D coupled reservoir flow - geomechanical simulations to predict the impact of different well drilling patterns and water flooding



IN THE COUPLED MODEL, reservoir fluid pressures (P) as a function of space and time are passed from the reservoir fluid flow simulation (left) to the geomechanical simulation (right). The oil reservoir sits within the central area (marked) of the finite element mesh built for the JAS3D geomechanical simulations that consist of several hundred thousand elements.

on well integrity in weak rock formations. The industry partners have incorporated the Sandia technique into their reservoir management practices. (6100, 9100) *Joanne Fredrich, fredrich@sandia.gov*

Many Sandians have made significant contributions toward the completion of the **Yucca Mountain Site Recommendation Consideration Report**. This report cumulates technical advancements in site characterization, performance assessment, and engineering design of Yucca Mountain. It will be given to the DOE Secretary for consideration in recommending Yucca Mountain as a geologic disposal site for high-level radioactive waste. If the Secretary decides to recommend Yucca Mountain as a suitable site, a Site Recommendation will be sent to the President in 2001. (6800, 6100) *Hong-Nian Jow, hjow@sandia.gov*

A new way to safely, simply, and effectively **connect electricity-producing photovoltaic (PV) solar systems** to utility company power grids has been developed. Several manufacturers have adapted it into their systems. This Underwriters Laboratories-certified control method automatically diverts or turns off electricity flow from grid-connected PV systems when an electric distribution line shuts down. *Joe Tillerson, jrtille@sandia.gov*

The Advanced Information System Lab (AISL) developed a radical and innovative new approach



DISHING IT UP — Rich Diver (6216) checks out the first prototype of the 10kW Solar Dish/Stirling Remote Power System, which incorporates the best of advanced solar technology developed at the Labs in recent years. A version of the solar collector will be placed on Indian lands in the Southwest where it will pump water for agricultural purposes. (Photo by Randy Montoya)

to computer security. It uses **intelligent agents to implement a dynamic defense**. It will have significant impact on Sandia's national security mission and commercial value to the multi-billion-dollar cybersecurity industry. The research team recognized the need for a paradigm shift in information security practices to meet the next generation Internet security threats and developed Standard Agent Architecture II (SAAII)/Agent-in-a-box, which incorporates several advances in state-of-the-art agent and information security domains. This research was funded by LDRD and DP funds. *Reynold Tamashiro, rstamas.sandia.gov*

Sandia recently completed a seminal report (NUREG/CR-6672) that provided **much more accurate risk estimates of transporting spent nuclear fuel**. The Sandia work is already being used to revise the Yucca Mountain Draft Environmental Impact Statement and will become a common reference for regulators, users, and the public. By matching accident statistics and accident conditions, and modeling cask and fuel response to those accident conditions, transportation accident dose risks were shown in NUREG/CR-6672 to be three to four orders of magnitude smaller than those in NRC's current EIS for radioactive material transportation (NUREG-0170), which demonstrates that shipping spent

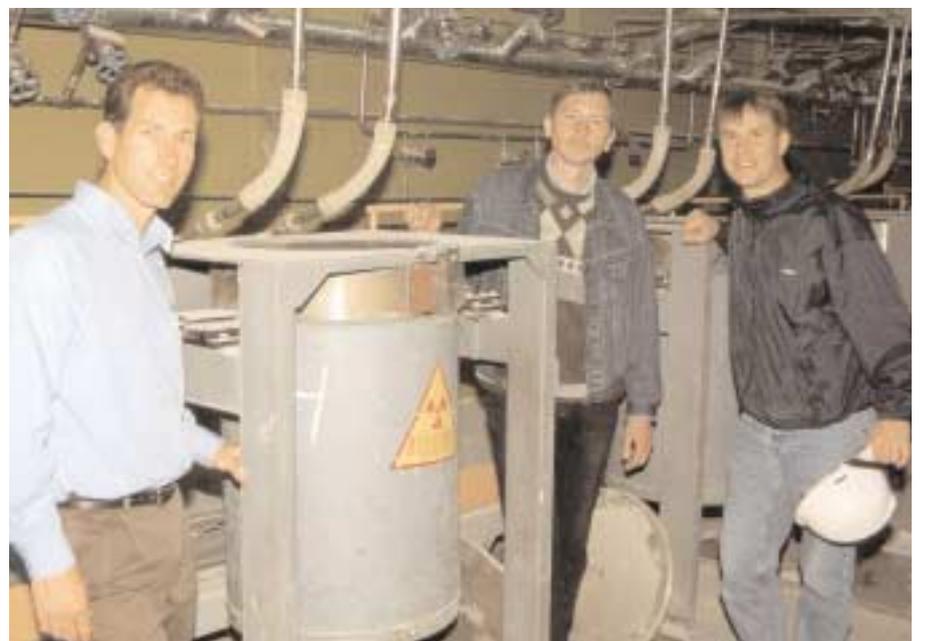
nuclear fuel is very safe. (6100) *Ken B. Sorenson, kbsoren@sandia.gov*

Emissions of sulfur dioxide (SO_2) from fossil-fuel combustion dominate the atmospheric sulfur budget. *In-situ* SO_2 measurements are required to address long-standing uncertainties about the influence of these emissions on local, regional, and global scales. Sandia researchers have recently developed a **laser-induced fluorescence detection scheme for SO_2** that has the requisite sensitivity (parts-per-trillion) for measurements throughout the atmosphere. They have constructed a prototype sensor, which has been used for ambient SO_2 measurements, and are developing a compact ultraviolet laser system for use in field studies. (8300) *Dahv Kliner, dakline@sandia.gov*

Significant improvements have been made in our **understanding of soot formation in diesel engines**, the most efficient

engine option available for transportation. Research has demonstrated that the amount of fuel-air premixing upstream of the initial flame location on a diesel spray plays a pivotal role in the amount of soot formed. The research is providing insight on how parameters such as injection pressure, orifice diameter, turbocharging, intercooling, etc., impact the soot formation in diesel engines and suggesting directions for reducing soot formation. (8300) *Dennis Siebers, siebers@sandia.gov*

In October 2000, Sandia completed a two-year project with Lockheed Martin with the commissioning of a radioactive waste processing facility at the Zvezdochka Shipyard in Severodvinsk, Russia. A similar facility will be commissioned in June 2001 at the Zvezda Shipyard in Bolshoi Kamen, Russia. These facilities support **Russian submarine dismantlement activities** funded by the US Defense Threat Reduction Agency (DTRA). Sandia technical staff led the design, construction, and licensing activities. Lockheed Martin Energy Technologies, the prime contractor for this DTRA project, contacted Sandia in 1998 seeking its international radioactive waste management experience to accomplish this first-of-a-kind facility. (6800, 6400) *Joe Jones, jojones@sandia.gov*



SUB WORK — Sandians Joe Jones (6849, left) and Joe Saloio (5327, right) with Oleg Pazhukin of the Russian design institute VNIPIET near sorbent columns installed at the “Zvezdochka” Submarine Yard in Severodvinsk, Russia.

Labs Support

A Passport for the Journey: What do you want to be when you grow up? Kids hear that question a lot, but have few chances to explore different careers. In response, Community Involvement joined with businesses, local government, and school districts to provide the first annual "School to World" event. School to World provided 1,200 middle school students a chance to discuss more than a hundred careers with people who are actually doing them. In addition to funding and event coordination, Sandia provided 65 volunteers. (12600 coordinated) *Amy Tapia, astapia@sandia.gov*

Sandia launched its first **Information Technology/Computer Science (IT/CS) Retraining Program** in June. Executive VP Joan Woodard and the Laboratory Leadership Team championed this Labs-wide, fast-track program that is led by Corporate Training and Development with partnerships across the Labs. The program grew out of increased demands for critical IT/CS skills, hiring limitations, a competitive external market, and Sandia's commitment to career development. (3500, 6500, 8500, 9300)

Building Bridges, Sandia's Participation in DOE's EEO/Diversity Standdown, engaged more than **8,000 participants in a forum for learning and dialogue** on building inclusion, trust, and respect in our work environments. Nearly 200 individuals working in more than 20 sub-teams in New Mexico and California contributed to this Labs-wide effort. As a result of the program, suggestions were produced for positive action to ensure goals that take full advantage of the diversity of people at Sandia. (3000, 8000)

Sandia/New Mexico Health Services Center's Clinical Health and Occupational Medicine organizations were recognized for quality programming and services with five President's Quality Awards, including three Golds. The Health Services Center was also awarded the **highest level of accreditation by the Accreditation Association for Ambulatory Health Care, Inc. (AAHC)**. (3300)

The Benefits Department oversaw the **renovation of the Bldg. 861 cafeteria**. This cross-organizational project included both internal and external organizations for the design and completion. Construction was done in half the normal time



Sandians and students at the first-ever "School to World" event.

required for a project of this magnitude. The upgrade ensures compliance with safety and code requirements; reduces maintenance costs; creates a more efficient flow of traffic as requested by customers; improves the ambiance in the dining area, and increases the quality of time spent there. (3300, 7800, 7100)

Sandia hosted its **Fifth Annual Summer Technical Student Symposium and Career Fair** on August 10 with 504 attendees, 150 presenters, and 26 exhibitors. The symposium culminated a 12-week program for 250 technical interns at Sandia. The program provided technical and professional development and required interns to prepare papers and presentations on assigned projects. The Symposium offered an opportunity for Sandia and Lockheed Martin, cosponsors of the event, to consider candidates for employment. (3500)

More than 100 women managers attended a one-day conference May 11 with the theme **"Creating a Woman-Friendly Culture at Sandia."** Executive VP Joan Woodard and HR were conference champions. The conference provided a forum to share experiences and make workplace recommendations. More than 100 summer and year-round interns attended Sandia's first "Technical Women of the Future" luncheon June 12. Speakers at the luncheon encouraged female interns to continue their pursuit of higher education in science, math, engineering, and technology and provided an overview of Sandia's philosophy and practices. (3000)

tractors, along with 4,000 visitors, were rebadged between April and June (mandated by DOE and conducted every five years). All received the newly designed DOE/Sandia standard badge. In connection with rebadging, all Limited Area entrances at Sandia/New Mexico were changed to require use of both badge and Personal Identification Number. These changes were accomplished with minimal disruption to the Lab. Personnel Security also issued the newly designed ES&H Quick Reference Card to more than 10,000 employees and contractors. (7100, 7800) *Bob Baca, rgbaca2@sandia.gov*

A diverse multi-department team **packaged and shipped enriched uranium to the Y-12 Plant**, reducing security risk and future costs. This multifaceted project presented a broad range of new challenges, each requiring resolution before work could begin. Concerted efforts of 40 individuals in 13 departments across three centers were necessary to plan, execute, and finalize the shipment. The synergy that evolved within the team was paramount to success. The corporate knowledge gained here will facilitate continued initiatives to deal appropriately with Sandia's legacy nuclear material in coming years. (7100, 10200, 6400) *Warren Strong, wrstron@sandia.gov*

The Facilities Custodial Services Department rolled out a new cleaning management process in FY2000. This process has **dramatically increased building tenant satisfaction** by improving cleanliness and efficiency while expanding the scope of services provided. The system is built around teams of specialists using more effective equipment and standard chemicals, and includes techniques for work loading and scheduling. The teams should be fully deployed during spring 2001. (7800) *James Kadlec, jckadle@sandia.gov*

During FY00, the Facilities Management and Operations Center (with Nuclear Weapons Strategic Business Unit funding) **demolished five buildings at the New Mexico site**. These demolitions eliminated more than 67,000 square feet of substandard space. The demolition program reduces operations and maintenance costs and allows building sites to be re-used for new mission requirements. During this same period, vacant space was reduced by some 7,000 square feet. This increased efficiency in the use of available space also reduces operating costs for the entire Labs. (7000) *L. Patrick Murphy, lpmurph@sandia.gov*

The **Processing and Environmental Technology Laboratory (PETL)** received the Program and Project Management 2000 award from DOE's Office of Engineering and Construction Management. This achievement was made possible by the dedicated efforts of many individuals who effectively teamed to construct this highly successful facility on schedule and within budget. The building, now completely occupied, is a state-of-the-art 21st-century materials science chemistry laboratory that provides a safe, efficient (energy savings of \$100,000 per year), and attractive work environment for its occupants. (1800, 7800) *Bill Hendrick, wehendr@sandia.gov*

In FY00, Sandia made **significant strides in resource conservation:**

- Earned two State Environment Department Green Zia awards for efforts to reduce energy and water use at the central steam plant and incorporate sustainable design into new building designs.
- Saved 22 million gallons of groundwater by

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Security and force protection

Sandia's Security Police Facility Command Center (FCC) became operational last April in a newly constructed, modernized area in Bldg. 956. It has state-of-the-art phone and radio systems, caller ID, and 911 tie-in. The new strategic location saves officers' time and transportation costs. Our old Headquarters Command Center in Bldg. 802 (unstaffed, but fully functional) is now the backup command center. No communications between Bldgs. 802 and 956 existed before installation of a fiber-optic pathway. (7100, 7800, 9300, 9500) *Janet Ahrens, jsahren@sandia.gov*

All Security audits and surveys received satisfactory ratings (DOE's highest ranking). Results noted **Sandia has made significant progress over the past year** in improving and strengthening the overall performance of the Safeguards and Security Program. In addition Sandia made notable progress in implementing the Energy Secretary's new security enhancements. Enhanced security procedures for vaults and vault-type-rooms were implemented. Unapproved space-savers were replaced with GSA-approved safes. Nonstandard storage locations are either manned or alarmed. (7100) *Terri Lovato, talovat@sandia.gov*

More than 10,000 employees and con-

The **College Cyber Defenders Program (CCD)** provides students with hands-on experience in the areas of information protection, computer security, networking, and distributed systems. The mentors and staff of the CCD program have developed a unique environment that challenges students with cutting edge research projects, while supplying multiple levels of new skills for students with varied computer backgrounds. The program has grown rapidly since its inception and has graduated two students to full time jobs at Sandia. CCD students assisted in the December 1999 security audits. *Nina Berry, nmberry@sandia.gov*

The US Air Force installation in Izmir, Turkey, is distributed throughout the city in various facilities, sometimes sharing the structures with non-US businesses (hotels, etc). The terrorist threat, at times, is real and imminent. For this nontraditional security application, Sandia **has provided and installed for the Air Force an intrusion detection and surveillance capability** to deter and detect intrusions and other activities that could preface a terrorist incident. Part of this system is now used as a model for a European-wide upgrade to the Joint Services Interior Intrusion Detection system. (5800) *Bob Graham, bgraham@sandia.gov*



Labs support

(Continued from preceding page)

reusing microelectronics wastewater for other operations at Bldg. 858.

- Made the case for Sandia to purchase "green electricity" beginning FY01. (5300, 6200, 7100, 7800) *Ralph Wrons, rjwrons@sandia.gov*

Facilities Management & Operations Center implemented a major change last year by establishing a **swing shift of five mechanical tradesmen** to perform preventive maintenance. This breakthrough action accomplished key objectives: minimizing disruptions to building residents; taking a proactive approach to reduce maintenance costs by significantly increasing preventive maintenance activities, thus reducing equipment failures; and, reducing overtime costs some \$50,000 per year. (7800) *James L. Rush, jlrush@sandia.gov*

Facilities Management and other exemplary operations at the California site completed the **demolition of the 85,000 sq. ft. Bldg 913** to provide a building site for the new Distributed Information Systems Laboratory. This was the largest deconstruction project in the history of Sandia. Following a difficult relocation plan, approximately 20 functions were relocated into 10 other existing facilities. With known building contamination the project team had to perform extensive and creative characterization and cleanup prior to demolition. The project recycled 6,500 tons of concrete and approximately two million pounds of metals (steel, copper, aluminum, brass). (8500) *Gary Shamber, gwshamb@sandia.gov*

A project that involved everyone at Sandia? Yes, Sandians and contractors working at the individual, team, Labs-wide, community, and national levels **assured that the Y2K transition was a non-event**. Thousands of hours were spent identifying and evaluating potential vulnerabilities of software, hardware, facilities, operations, & safety and security systems. The success of this project is a tribute to all who demonstrated true teamwork, thoroughness of execution, and dedication. Participants represent every organization in the company, their DOE & LMC counterparts, and staff at the KAFB. (7000) *Nancy Freshour, nlfresh@sandia.gov*

Sandia received several awards in recognition of its outstanding achievement in providing **contracting opportunities to small business and its exemplary outreach activities**. These awards include: DOE's Management and Operating Contractor of the Year Award, the U.S. Small Business Administration's Dwight Eisenhower Award for Excellence, the Southwest Region Business Advocate of the Year Award, and the District II Corporate Hispanic Advocate of the Year Award. (10200) *Cynthia Schneeberger, ccschne@sandia.gov*

Oracle ERP implemented and stabilized: Sandia's Oracle ERP system was stabilized after coming fully on line in October 1999. Included in the implementation and stabilization were improved response times, development of substantial additional reports for line customers, ongoing training programs, and accomplishing the first year-end closing using the Oracle system. (9500, 10200, 10300, 10500, 14000) *Cynthia Schneeberger, ccschne@sandia.gov*

Pension plan benefits were approved that increased income for retirees and surviving spouses effective Oct. 1, 2000. The benefit changes included increases in pension benefits from 3 percent to 18 percent for eligible participants and the introduction of minimum pensions. (3500, 10300) *Cynthia Schneeberger, ccschne@sandia.gov*

Sandia's Legal, Procurement, and HR organiza-



Sandia employees made a difference in their community once again. More than 300 Sandia employees, contractors, family members, and friends, partnered with retiree Irv Hall and Judy and Ronald Ewing to build a Habitat for Humanity house. Irv Hall (above) donated the \$30,000, the Ewings donated the land, and Sandia volunteers pounded nails, hung wallboard, textured, painted, had fun, and completed the house in seven working weeks. Others donated lunches and snacks or contributed to the Carpenter's Fund. The Zozaya family calls Hall House home. (Photo by Randy Montoya)

tions worked with Sandia Staff Augmentation suppliers to **develop and implement an alternative to the three-year rule** which had previously limited contract associates' service to a maximum of three years. The alternative manages co-employment risks in an innovative manner, enabling Sandia to retain the services of more than 425 trained and valued individuals. These people would have had to be replaced, increasing overall costs and reducing productivity. Instead, they can remain at Sandia. (3500, 8500, 10200, 11200) *Skip Reeder, chreede@sandia.gov*

Logistics developed a **cost-effective way to meet DOE regulatory requirements** for on-site transportation of hazards. It consolidated operations teams involved in hazardous material storage and transportation in one location and commenced cross training. It excelled in numerous audits, most notably an audit of Shipping and the Federal Motor Carrier Program by the Department of Transportation. It reduced the amount of time required for hazmat training certification and formed the Packaging and Transportation Management Committee to leverage corporate resources. (10200) *Bob Eldredge, rvseldr@sandia.gov*

A team led by the Export Control Office obtained funding from DOE/DP and completed design, development, and roll out of an **on-line training program called EC100**. This modular system automatically tailors the depth and breadth of the training to be taken based on the student's responses to an initial set of eight questions. EC100 has been completed by more than 250 people at Sandia, and has been requested by DOE and DoD as a model for next-generation training tools. (2900, 3500, 9500, 10000, 10300) *Chad Twitchell, catwitc@sandia.gov*

Sandia received **DOE approval to make several significant computer codes available** under open source licensing. Open source licensing, used for common software packages such as Linux, allows a broad community of researchers to use, improve, and share improvements to software. Open source licensing will help transfer important technology from Sandia, and will allow Sandia to leverage the efforts of others in improving technology important to our mission. The codes currently approved for open source licensing include Cplant, Zoltan, Chaco, and Verde. (9200, 11500, 1300) *V. Gerald Grafe, vggrafe@sandia.gov*

Sandia's Legal Division supported the Contracts Organization in another successful effort to execute a "fee and scope" amendment to our prime contract. The amendment **enables a stable flow of fee to Sandia**, which is used to compensate our corporate parent for its contributions to the Sandia mission, and to pay for expenses and

costs of Sandia, which are either "unallowable" under our prime contract or would be viewed by DOE as either excessive or unnecessary. (11200, 10000) *L. S. Greher, lsgrehe@sandia.gov*

For 2000, the National Atomic Museum increased children coming to acclaimed **Science is Everywhere Summer Camp** from 80 in 1999 to 160 children in 2000. For 2001, the camps will increase again and offer second site services at the Hispanic Cultural Center. In addition, the museum served 18,569 school children with six educational programs for ages K-12. The museum presented three programs called "Young Women Take Flight" to accompany a Smithsonian exhibition, Women in Flight, which was at the museum January to May 2000. *James Walther, jkwalth@sandia.gov*

In strategic planning, the Laboratory Leadership Team **refined the vision for the Laboratories** developed 10 years ago, including revised values, revised purpose, and a new "highest goal." To study the long-term external environment, LLT also developed scenarios for the future, following the approach developed by Global Business Network. The four scenarios show plausible futures that the Labs could find itself dealing with in 15 years. Planning activities this year will challenge program managers to develop robust strategies for success in each of the scenarios. (12100) *Lori Parrott, lkparro@sandia.gov*

The Congressional Testimonies Team prepared seven congressional testimonies in FY00 — nearly triple that of any previous year. The **testimonies have created or enhanced relationships** with key staffers and lawmakers in Congress. The integrity, candor, and responsiveness of the testimonies and written statements have improved congressional perceptions of the Labs. (12100)

The Government Relations team, working through the SBUs/SMUs, **developed a Congressional Issues Document** that contains a set of well-defined, prioritized issues whose resolution are critical to Sandia's success. The document contributes significantly to conveying a uniform, consistent Laboratory message that has already been demonstrated to be effective. In concert, they developed a Washington strategy that will ensure that Sandia is properly positioned to help shape the resolution of issues of importance to national security. (12100)

The Ombuds team has intervened on contractor dispute issues, diversity issues across the complex, and nearly 600 cases involving individuals within the Labs. The **Ombuds team interacts with all Sandians** to ensure common understanding of differences and to provide a basis for dispute resolution. It is recognized across the DOE complex as a model program for excellence and is repeatedly called on by DOE at all levels to assist in developing approaches for dispute resolution. (00011 and 00012)

The President's Quality Award team serves a corporate strategy to target project teams for self-assessment and review of processes and customer relationships. This year, the number of **applications increased 40 percent** over last year and a record of nine gold awards was obtained. The PQA program received two international awards for its promotional videos. This year, the ceremony was aired live and sent electronically to a total of 700 participants. (12100)

The **Trades Training Program (TTP)** is operated by Sandia in cooperation with the Metal Trades Council, Albuquerque TVI, and Albuquerque Public Schools (APS). Attrition in Sandia's skilled Trades strategic workforce is affecting product realization capabilities. The TTP aims to maximize use of community resources, existing Sandia programs, and a new approach to training that produces fully qualified trades people at greatly reduced cost. (14100, 3500, MTC) *Phillip Gallegos, plgallego@sandia.gov*