Sandia sensor has potential to help US military eliminate 'friendly fire' deaths during combat

Tagging device monitored from air to ground; Army to conduct tests this fall

By Michael Padilla

A device to help eliminate "friendly fire" during military combat has been created by Sandia engineers.

Building on more than 10 years of research and development, Sandia engineers have created a radar tag sensor that is mounted on military vehicles and which is recognizable to an attack aircraft as a "friendly." The device, tracked via aircraft radar, can be used to identify both US and coalition forces during combat to avoid fratricide. During war, fratricide is the act of killing one's own soldiers.

Lars Wells (2344) and a team of Sandia engineers have completed numerous tests and identified partners and potential customers for the sensor, which will be tested by the Army this fall.

One of the selling points is that the researchers have shown the sensor can work with multiple radars and multiple aircraft, says Lars.

"It is mature enough to consider as a fratricide and situational awareness solution now and for the long term," he says.

Radar echoes

The sensor, dubbed by the Army "Athena" — protector of the troops — is not a radio transmitter that broadcasts a signal for the aircraft to

(Continued on page 4)

FRIENDLY DEVICE — Lars Wells (2344) displays a prototype of the radar tag sensor. (Photo by Randy Montoya)

Sandia LabNews

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Sandia National Laboratories

Bringing power to remote Central American villages

A Sandia team is installing sustainable energy systems to bring electricity to places where it has never been available before. Iris Aboytes writes about Debora Ley's adventures on the project in a story beginning on **page 6.**

2003 ethics survey clarifies how supervisors should handle employees' ethics concerns

Some 3,100 Sandians took Lockheed Martin survey last fall — 29 percent say they observed ethics misconduct

By Chris Burroughs

Responses to 13 new questions in the 2003 Lockheed Martin ethics survey that some 3,100 Sandians took last fall are clarifying how Labs' supervisors handle ethics.

"We found that most Sandians are generally satisfied with the way their managers listened, handled, and provided feedback about ethics concerns — from the beginning when misconduct was first identified to the follow through," says Linda Vigil-Lopez, Manager of Ethics Office 12810. "The new questions also showed that supervisors talk about the importance of ethics and that employees trust supervisors to keep commitments."

Otherwise, 2003 survey results were generally consistent with the survey administered to employees in 2001, which indicated that Sandians view ethics in the workplace as necessary to doing good business and that employees have a high satisfaction with the Labs in general.

All Sandia employees were asked to take the anonymous survey between Nov. 3 and Dec. 3 of last year. Thirty-one percent responded using the various options available to them, including e-mail, paper, and telephone. Some 46,000 Lockheed Martin employees around the world took the same survey. Similar surveys were offered in 1995, 1997, 1999, and 2001.

A few areas of concern that emerged in the survey included:

• Pressure to compromise company's ethical standards. A small portion of Sandia respondents — 10 percent — said they felt pressured periodically or often by other employees or management to compromise the company's standards of ethical business conduct in order to achieve business objectives. Of that 10 percent, 46 percent said the reason was due to pressure attributed to aggressive objectives, and 41 percent attributed the reason to schedule pressures.

• Personal observance of misconduct. Twenty-nine percent of the Sandia survey takers indicated that they observed ethics misconduct in the past year, down two percentage points from

(Continued on page 4)

Sandia's CMC, Arab foundation to help revitalize Iraqi science infrastructure

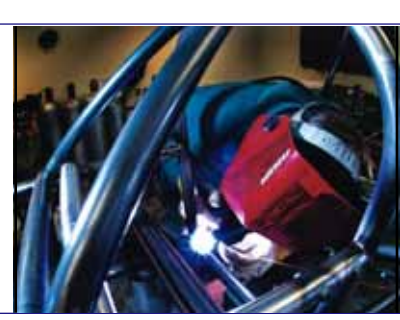
By Neal Singer

A cooperative effort is underway between a group of Arab scientists and Sandia researchers to help rebuild key elements of Iraq's scientific infrastructure.

The agreement was announced last week by the National Nuclear Security Administration (NNSA) between the Arab Science and Technology Foundation (ASTF) and Sandia's Cooperative Monitoring Center (http://www.cmc.sandia.gov).

In phase one of the project, ASTF will survey Iraq's science and technology situation to identify critical areas of Iraqi scientific strengths and technical needs. The survey will document Iraqi expertise in areas critical to reconstruction, as well as in potential areas of peaceful

(Continued on page 5)



What's what

Curious Charles' interest was piqued recently by a blurb in the Secretarial Services Wednesday Weekly urging people to save the tabs on beverage cans as a contribution to Ronald McDonald House. So he did a little 'snoping' (www.snopes.com) to see if what seemed suspiciously like an urban legend was.

It wasn't.

Said the Snopes page (www.snopes.com/business/redeem/pulltabs.asp): "Seeing as how folks were bound and determined to collect pull-tabs for charity, in 1987 McDonald's found it a good idea to get into the act. Their Pop Tab Collection program (scroll down the Snopes page and click on McDonald's) is a response to pull tab-mania, and although its web presence perpetuates the myth that the tabs are made of a purer form of aluminum than the rest of the can, it at least provides folks with a place to dump the tabs they've been hoarding over the years in the belief they could use them to purchase dialysis time for an ailing child. Tabs dropped off at various McDonald's are taken to a local recycling company, and the money made from selling them for their scrap value is given to the local Ronald McDonald House to help defray operating costs."

No urban legend, but quirky — at least.

* * *

Another cute spell-checker miscue:

An invitation from ¡Salud! beckoned: "So, come over and see our new Xanadu nested tidally between some of Sandia's historic technical facilities."

To which observant and nautically minded Bruce Hansche (9122) responded: "I wonder — does its size or location vary with the lunar cycle?"

Prompting Medical Director Dr. Larry Clevenger's (3300) *mea culpa:* "Yikes! The word should have been 'tidily.' The facility location will remain the same, but apparently my ability to spell is influenced by the moon."

* * *

And to that shy retiree who corrected my spelling: You're right, it's vaseline — with an "e" — not vasoline.

* * *

Although there was little fanfare, the Department of Homeland Security (DHS) observed its first anniversary last week. After its creation by Congress, DHS faced the huge task of striving immediately to make our nation more secure and simultaneously merging about 180,000 people and 22 agencies into an organization of workable groups.

DHS has come a long way in just a year, and some of that progress is due to the strong working relationships that Sandia and other national labs established with DHS long before it became a cabinet-level agency (it was formerly the Office of Homeland Security).

An upcoming *Lab News* piece will include the Labs' role in helping DHS get organized, some Sandia technology that is being applied or considered to enhance our homeland security, and how we continue to support and work with DHS. It will be interesting reading.

— Howard Kercheval (844-7842, MS 0165, hckerch@sandia.gov)

Sandia LabNews

Sandia National Laboratories

http://www.sandia.gov/LabNews

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Sandia Corporation Savings Plans removing Janus Worldwide Fund

Effective March 31, 2005, Janus will be removed from the Sandia Savings Plan fund options

Sandia's Investment Committee, which is responsible for the selection and removal of investment options within the Sandia Corporation Savings Plans, has voted to remove the Janus Worldwide Fund from the available investment options within the Plans.

The Investment Committee made the decision in January because a number of organizational and personnel changes at Janus decreased the Investment Committee's confidence that this fund's poor relative performance will improve in the foreseeable future.

Effective March 31, 2004, at 4 p.m. EST, the Janus Worldwide Fund will be closed to new contributions. If participants do not request a change to how their contributions are to be invested by this date, contributions that had been directed into the Janus Worldwide Fund will be redirected into the Interest Income Fund.

Effective March 31, 2005, the Janus Worldwide Fund will be removed from the Sandia Savings Plan fund options. If remaining balances are not exchanged by this date, the monies will automatically be exchanged for you into the Interest Income Fund.

The Janus Worldwide Fund charges a short-term redemption fee of 1 percent if shares are sold or exchanged before the completion of a 90-day holding period (effective Oct. 1, 2003). The short-term redemption fee can be avoided if a participant holds the shares for at least 90 days before exchanging or selling.

Participants interested in international stock exposure have the following options available in the Savings Plans: the Spartan International Index Fund, Templeton Foreign Fund-A, and three Life Strategy Options, which hold between 5 percent and 15 percent in international stocks.

For contribution changes (http://contributions.netbenefits.com), exchanges (http://exchanges.netbenefits.com), and information on all fund options (http://yourcompanyplan.netbenefits.com), select the appropriate link, or call Fidelity Retirement Benefits Line at (800) 240-4015. For other questions about this action, call Rebecca Spires (505) 844-9965 or Jane Farris (505) 248-1659.

Stevens to succeed retiring Coffman as CEO of Lockheed Martin

Vance Coffman announced Monday that he plans to retiree Aug. 6 as chief executive officer of Lockheed Martin, to be succeeded by current President and Chief Operating Officer Bob Stevens. Stevens, 52, will also retain his current position as president.

BOB STEVENS

Coffman, 59, who has been with the company 37 years, said to assist an orderly transition, he plans to serve on the board as a nonemployee chairman until April 2005.

"The board and I are extremely pleased by the selection of Bob Stevens as my successor," Coffman said. "He is an exceptional leader with great vision and a deep understanding of the industry, our customers, and our Corporation."

Stevens headed Lockheed Martin's Energy and Environment Sector before becoming chief financial officer and then, in October 2000, president. "I am deeply honored to be given the opportunity to lead this great company and its 130,000 extraordinary employees," Stevens said.

Site hears latest news on four key R&D projects

Symposium focuses on hydrogen storage, rad monitor, dental disease markers, fiber-optic lasers

By Nancy Garcia

Some late-breaking news came during the latest R&D Focus Symposium showcasing work by researchers at the California site. A nuclear reactor where Sandia is testing a radiation monitor just entered a maintenance shutdown, and Jim Lund (8232) learned during his talk from a team member in the back of the audience that the change was picked up, confirming the monitor works as planned.

Jim described the ongoing work on this anti-neutrino detector at the San Onofre Nuclear Reactor and also the development of a small neutron generator for use in probing the presence of nearby nuclear materials. He was among four researchers who described their projects during the symposium, the third since the series began about two years ago. Organized by a committee of Distinguished Members of Technical Staff, the series is open to the site as a whole.

Calling the collection of talks "very, very interesting and very exciting," California Laboratory VP Mim John thanked the entire committee for bringing the series to the site.

First up were Jay Keller (8367) and Weifang Luo (8773), describing hydrogen energy research, particularly work at the California site to investigate storage of the volatile gas in powdered metal hydrides, where it is absorbed like water in a sponge. The hydrogen is nonflammable on the hydride bed, and can be drawn off as needed to power a fuel cell to operate a vehicle without creating greenhouse-gas-generating tailpipe emissions.

DOE would like to find a way to store at least 6 weight-percent of hydrogen onboard a vehicle where weight and volume constraints are important. Weifang described a promising compound hydride that may achieve that goal, which is being studied to optimize its operating temperature and pressure.

Jay and Jim Wang (8773) have proposed for Sandia to be a DOE "Center of Excellence" in hydrogen storage, and is also working with Chris Moen (8752) on safety codes and standards, carrying out hydrogen-release studies with SRI.

Next Jim described how a detector the size of a small room installed near the core of the Southern California nuclear reactor is being investigated for its utility in determining whether any fissionable material is being diverted. The monitor detects about one-fourth of the antineutrino flux predicted from the radioactive material that powers the reactor.

Sandia has also developed a meter-tall neutron generator that could interrogate nuclear material by "pinging" it with neutrons that would incite the release of secondary particles that can be detected. The next iteration should be smaller, he says, and a prototype will be tested soon.

Another talk described a new foray for Sandia into a collaboration with the University of Michigan School of Dentistry and Cornell University on engineering the MicroChemLab to detect markers of periodontal disease in saliva. The hand-held device potentially allows better, faster, potentially cheaper analysis of components in liquid samples, and has demonstrated separation of six proteins in less than 30 seconds in a microchannel measuring just 1 millimeter.

Periodontal disease affects more than half of US adults, 20 million to 45 million of them severely, and may be an initiating cofactor in serious systemic illness that costs $5-6 billion annually. The goal is to be able to screen for a bacterial infection, gingivitis, which causes inflammation of the gum that leads to bone loss if unchecked.

Anup Singh (8130), who is leading the project with Victoria VanderNoot (8130), said patients conceivably will be screened during routine appointments by collecting saliva on a strip of paper inserted between the tooth and gum. The saliva would be subjected to an immunoassay on the microchip while the patient waits. Future improvements to the hand-held chemical analysis device might include changing the detection system (which currently employs a light source) to rely on chemiluminescence.

Wrapping up the symposium, Dahv Kliner (8356) talked about his breakthrough in a collaboration with the Naval Research Laboratory to amplify the power in fiber-optic lasers and change the wavelength to usable visible or ultraviolet light.

Dahv said their year-old record still stands of showing the highest levels ever extracted from a fiber light source of peak power, pulse power, and average power.

By selectively bending the fiber, they were able to direct the energy toward a stable beam that has 20 to 30 times the power of a typical fiber laser. The fiber is doped for optical gain, and the strategic coiling selectively eliminates unwanted modes without any loss of efficiency.

A series of three crystals converts the infrared light to visible or ultraviolet, which is particularly useful in the $500 million annual materials-processing market, among other applications. The invention fits in a box measuring 4.5 by 3.5 inches, which is two orders of magnitude less than the competing technology, and can deliver watts or tens of watts of power with no substantial additional breakthrough, Dahv said, commenting, "we've really just scraped the surface."

SHAPE OF THINGS TO COME — The current neutron generator package that Jim Lund (8232) described in his R&D Focus talk is expected to be made even more compact in its next version. Here, Kristin Hertz (8772) and John Steele (8232), the principal investigator and lead mechanical engineer, respectively, show the neutron generator in the device that has been developed over the past two years. (Photo by Bud Pelletier)

Sandia CaliforniaNews

Feedback

Q: *How exactly is the Extended Travel Allowance payment calculated? According to the "Request for Payment of Extended Travel Allowance" form, the rate is supposed to be 15 percent of my base pay. I have submitted a few of these forms; lately, however, no matter how I calculate it, what shows up on my paycheck (before tax) does not even come close to being 15 percent of my base pay for the affected period.*

A: The calculation for the Extended Travel Allowance is as follows: 15 percent of the base pay up to a maximum base of $50,000 with a total maximum allowance of $7,500 annually. After this amount is calculated, it is divided by the number of days in a year and then multiplied by the number of days of the extended travel.

Thus if an employee makes $75,000 annually and is on extended travel for 20 days, the calculation would be as follows: (.15 x $50,000)/365) x 20 = $410.96. If you have specific concerns regarding your calculations, please feel free to contact the Payroll Department.

— Jesus Ontiveros (10502)

* * *

Q: *I just read a Feedback Q&A about the traffic lights at NCO bypass and 12th Street that are scheduled to be replaced in 2004. Will this include pedestrian traffic light controls and additional crosswalk striping? This area is really fun to get across in heavy traffic.*

A: Thanks for the inquiry; there are no current plans for pedestrian controls or additional crosswalks at the intersection of NCO Bypass and 12th Street. Pedestrian controls would require a significant investment by the USAF for new poles, additional signals, and supporting infrastructure. The criteria for the placement of crosswalks are presented in the Manual of Uniform Traffic Control Devices. The current crosswalks meet these criteria; any additional crosswalks would not meet these criteria for providing safe crossings.

— Ed Williams (10864)

Tag sensor

(Continued from page 1)

receive. Instead, the sensor creates synthetic radar echoes, so that the radar picks up the sensor signal in the same way it picks up radar echoes from tanks, trucks, or other objects.

In general, the radar transmits a pulse of energy then looks for the reflections of that energy from objects on the ground. The tag sees the radar's transmitted pulse and sends it back to the radar, except it adds a little bit of data to the reflection (or echo).

"Blue-on-blue" incidents have long been a problem during war. "Developing the capability to identify 'friendly' vehicles in battle will bring about a great reduction of fratricide."

As the radar picks up (or receives) all of the reflections from the ground, it looks for that unique data signal. Once the radar sees that data on an echo it knows it is looking at a tag, and places an alert icon on the pilot's screen. The project has good system integration between tag and radar, Lars says, which is key to making it usable.

"Generally the radar will be nearly as accurate in locating a moving tag as it would be in locating any other moving object," he says.

MILITARY SUPPORT — Rick Ormesher (2344) explains where the radar tag sensor will be placed on a military vehicle. Rick has been the project's technical lead for the last four years. (Photo by Randy Montoya)

Eliminating fratricide

According to the Department of Defense, 24 percent of the 146 American battle deaths during Operation Desert Storm were by friendly fire. A further 15 percent of the 480 wounded were also by friendly fire. Historically, fratricide accounts for 10-15 percent of wartime casualties.

"Blue-on-blue" incidents have long been a problem during war, says Lars. "Developing the capability to identify 'friendly' vehicles in battle will bring about a great reduction of fratricide."

The sensor has shown the potential to truly save lives on the battlefield, "but it can also assist battlefield situational awareness," he says. "Many times during combat the military has to pull back from an attack plan because they don't know who is on the ground."

The Radar Tag Sensor team

Marjorie Kirkel (2305), Stephanie Otts, Don Small, John Mathews (2341), Lars Wells, Rick Ormesher (2344), Mike Murphy, Ana Martinez, Ken Plummer, Ken Smith (2346), Jeff Hollowell, Mike Gardner (2348),General Atomics Corp., and Sierra Monolithics Inc.

Lars says a future path of the project is to include tags on every soldier.

Keeping costs down

Mike Murphy (2346), Sandia's longtime tag expert, says one way of keeping costs down is by making the tag work easily with existing systems.

"The aim of affordability is a big factor of the project," says Mike. "By adding tagging to existing radars, we don't need to build new equipment for the aircraft."

Costs can also be kept to a minimum by partnering with industry and with various military agencies.

"Our industrial partners will be able to take this technology and drive the cost down quickly so that it is affordable for every Army vehicle and Air Force fighter jet," says Mike.

Technological support

Recent underlying development has been supported by DOE's Nonproliferation Office, which has an eye toward using the technology to track proliferants. In fact, this application was how Sandia started to create what became Athena, says Lars.

"The aim of affordability is a big factor of the project. By adding tagging to existing radars, we don't need to build new equipment for the aircraft."

The current project is sponsored by the Army's Communication Electronics Research, Development, and Engineering Center (CERDEC), which is staging a large exercise this fall that will demonstrate the tag system for high-ranking officers and regular soldiers alike.

"Sandia was the only developer that could ready a tag to support their short deadline," says project leader Rick Ormesher (2344). "We were able to do an initial demonstration for the Army in January 2003 with only a few months worth of effort."

The success of that initial demonstration helped lead to the current effort, says Rick.

"We are really excited about the prospect of deploying this technology and seeing it make an impact," says Lars.

Ethics survey

(Continued from page 1)

2001.

• Failure to report misconduct. And of the 29 percent, 39 percent reported the misconduct to a manager or another appropriate person. A concern is that the majority of people (61 percent) do not report this observed misconduct to management or another appropriate person.

• Report unethical activities without fear of retaliation. Overall there is an upward trend that more employees (57 percent) feel they can report unethical practices without fear of retaliation, an increase of 2 percentage points from 2001. However, there is still room for improvement.

• Supervisor fails to discipline those who violate ethical standards. One concern is that only 42 percent of the respondents believe their manager disciplines employees who violate the corporation's ethical standards. (Note: Because of privacy issues, the respondents may not be aware of disciplinary actions.)

In general, the results of the survey showed that Sandians take ethics seriously and want to do the right thing.

"This is shown, not only in the survey, but in the increased number of people coming to the Ethics Office with concerns," says Jennifer Crooks, Director of Audit and Ethics Center 12800. "More and more, when people note ethics misconduct, they are reporting it so the misconduct can be addressed by management."

Last year 263 inquiries and 34 investigations of possible ethics misconduct were handled by Sandia's Ethics and Business Conduct Office. Following investigations, about 40 percent of the cases were substantiated — shown to be valid with corrective action taken. These allegations of misconduct were reported by employees, retirees, contractors, and vendors.

Linda says now that the Ethics Office has the results of the survey, it will closely analyze data and write an action plan, as was done with previous years' surveys. Following the 2001 survey, the office increased its communication efforts to alert people to the importance of ethics in the workplace. Office staff committed to increased visibility by initiating a quarterly case study sent to managers for discussion with staff that described an ethics misconduct case. The Ethics Office staff began including ethics quotes in the *Porcelain Press* and visited with vice presidents and directors to informally discuss the ethics programs and relay issues and trends. In addition, Jennifer reports statistics, trends, and issues to the Sandia Audit and Ethics Committee, a subcommittee of the Gover-

Look for your copy of the annual ***Lab News*** Labs Accomplishments issue soon

The 2004 Labs Accomplishments issue, dated March 2004 — 16 pages, printed in full color on quality paper — is at the printer now (on a special press in Colorado Springs). It will be delivered soon to each employee and on-site contractor and mailed to retirees and our outside recipients in government, industry, and universities.

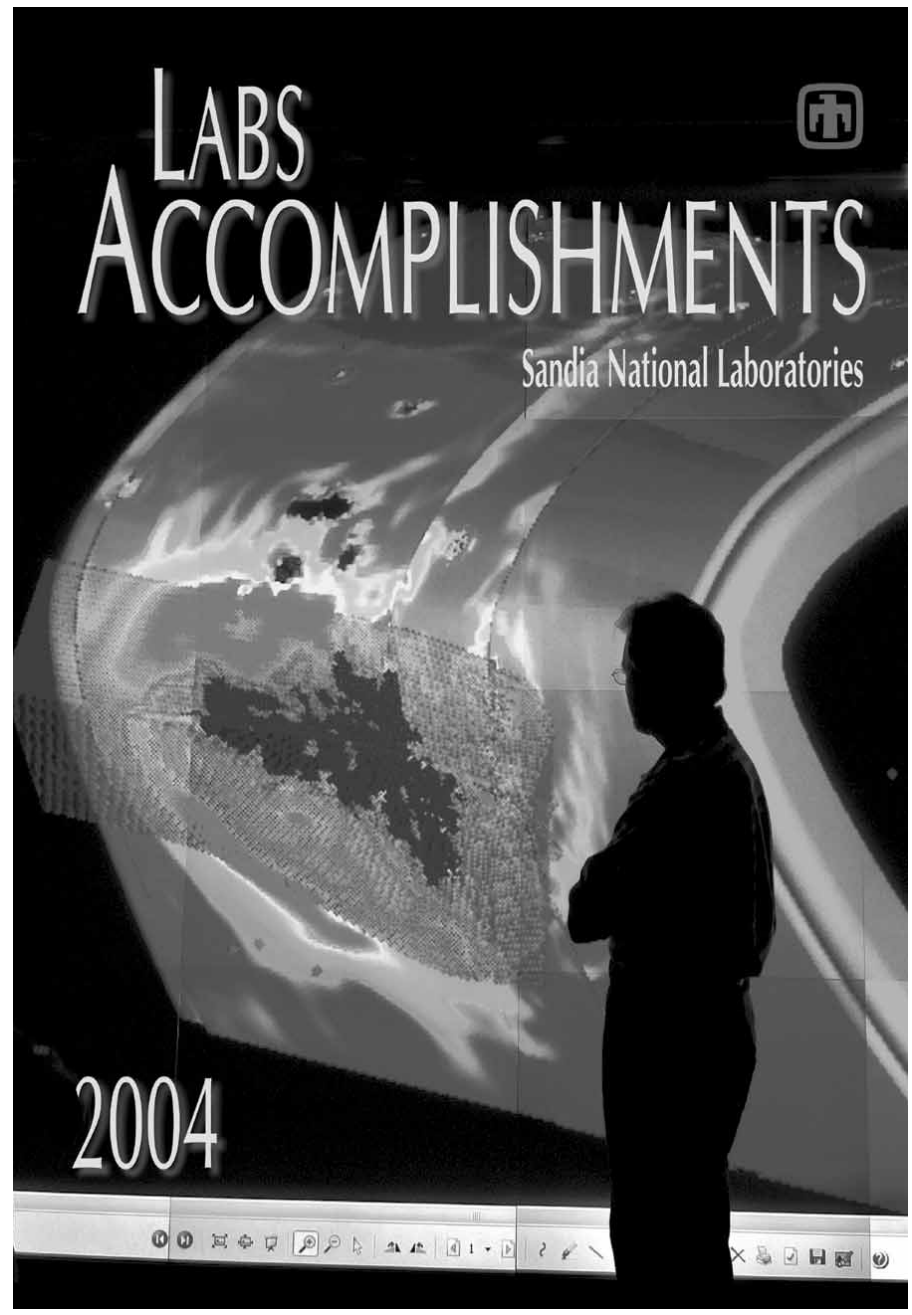
Extra copies have been printed for recruiting purposes and for special mailings to Sandia friends and customers.

This year's issue includes succinct summaries of approximately 150 Labs accomplishments over the past year, illustrated with 50 color images.

The categories are nuclear weapons, homeland security, nonproliferation and assessments, security, materials/physics/chemistry, bio/nano/cogno, computing, energy and infrastructure assurance, pulsed power and radiation effects, military technology and applications, technology partnerships, manufacturing and production, community outreach, environmental management and remediation, electronics, engineering science, and Integrated Enabling Services (health and wellness, human resources, financial, and facilities/administration/logistics).

This annual *Lab News* project is carried out in close cooperation with Sandia's VPs (who make the selections), technical staff, and Labs Director C. Paul Robinson, who provides an introductory note.

For many years, the annual Labs Accomplishments issue was distributed as an insert inside a regular issue of the *Lab News*. Beginning in 2002 it has been printed on glossy paper and distributed as a separate special issue. — *Editor*



The cover photo for this year's Labs Accomplishments issue is by *Lab News* photographer Randy Montoya. In it, Sandia researcher Kenneth Gwinn studies a large-screen projection of a Sandia computer analysis of the damage done to the leading edge of a space shuttle wing by insulation material striking it at near-supersonic speeds. The Sandia analysis, done at the request of NASA, played a key role in helping NASA determine the cause of the space shuttle *Columbia* accident.

Iraqi science

(Continued from page 1)

scientific development.

"We both [at ASTF and CMC] had the idea of engaging the Iraqi S&T community," says Arian Pregenzer (6920), Sandia senior scientist. "We decided to combine our ideas into one proposal that could take advantage of Sandia's experience working with scientists in Russia and the Newly Independent States on peaceful research and development, as well as ASTF's extensive contacts in Iraq."

"We're trying to help revitalize the Iraqi scientific community."

Sandia worked with ASTF to help establish the survey's goals, says Arian. An ASTF team entered Iraq in late January and established a temporary office in Baghdad for completing their survey. They also recruited a team of Iraqis to assist in their work. Plans are to brief Washington officials of their results in March, and then plan an international workshop to obtain international support and funding for high-priority projects.

"We're trying to help revitalize the Iraqi scientific community," says Arian.

The Arab Science and Technology Foundation, headquartered in Sharjah in the United Arab Emirates, is a nongovernmental organization established to stimulate scientific research in the Arab world. Its president, Abdalla Alnajjar, holds a physics PhD with a focus on solar energy. He is professor of physics and Director of Research at Sharjah University.