TRUPACT-III drop test nets valuable data on waste cask

By Will Keener

Taking a look at TRUPACT-III with David Miller, manager of Sandia’s Materials Transportation Testing and Analysis Dept. 6765, the first adjective that comes to mind is “big.” The massive transportation container is impressive by any standard. TRUPACT-III is designed specifically to move large items to the Waste Isolation Pilot Plant site in Carlsbad, N.M., David says. The 8.2- by 8.7- by 14-foot stainless-steel, 55,000-pound package is designed with multiple layers to protect its cargo.

Walking around TRUPACT-III, David points out the protected heads of giant bolts that hold its heavy stainless-steel lid protection panel in place. (The actual lid is buried two feet into the package.) The energy-absorbing foam between inner and outer container boxes can’t be seen, but its presence is acknowledged by blowout plugs in the outer package. These plugs allow the foam to expand and escape in case it is caught in a fire, he says.

During the past two weeks, a team of Sandia researchers in remote Coyote Canyon have been testing the mettle of TRUPACT-III for its builder, Packaging Technology, Inc. (a subsidiary of Areva), to determine if it can qualify for Nuclear Regulatory Commission certification. A Sandia team has chilled the giant container to minus 40 degrees F, dropped it 30 feet onto an unyielding surface of battleship steel underlain by 24 feet of concrete, and attempted to puncture it at various angles of address.

Staff members from the Western Governors’ Association and the NRC, along with DOE officials, were on hand at Sandia’s Aerial Cable Site to view the tests. The series of tests at the remote site are designed to attack all the weak points in the container. Doug Ammerman (6765), project manager for the testing. But the container is designed to take the beating. “It’s really a box highly interconnected world where there are complex threats — military and political threats

(Continued on page 6)
Sandia researchers win ‘Better Way’ award

Three Sandia researchers together with fellow team members from Delta Airlines, Direct University, and the Federal Aviation Administration (FAA) William J. Hughes Technical Center were awarded the FAA’s Transportation Technology University, America (ATA) Non-Destructive Testing (NDT) Forum “Better Way” award last month.

The “Better Way” award — jointly sponsored by the FAA and ATA — recognizes the team of government and airline industry individuals who collaborate to advance inspection or testing of aircraft structure, components, or systems. ATA is the industry trade organization representing more than 90 percent of US passenger and cargo airlines.

Recieving the award from Sandia were researchers Mike Bode (6414), Floyd Spencer (12237), and David Moore (2724).

David says the award was for work done over a two-year period. As part of the project, a Boeing 727, flown successfully by Delta for 28 years and decommissioned, was dismantled so that team members could study lap joints — the locations where the skins of aircraft overlapped. They then assessed 20 different NDT inspection techniques used by airlines and emerging inspection technologies developed by NDT researchers to determine which were most efficient and worked in a timely fashion.

The question we were trying to answer was not if the airplane had flaws, but what was the best inspection technique,” Floyd says.

Similarly, David and Mike went through the plane was dismantled, observed inspections, and gathered data. Floyd assisted with the data that showed how well the inspection methods worked.

The results of their efforts have been documented in a database that will be available at airlines and repair stations the information they need to make informed decisions about the capabilities of various inspection techniques.

This is the third year Sandians have won the “Better Way” award in collaboration with industry. They also won it in 2003 and 2005.

— Chris Burroughs

Recent Patents

Robert Crockter (8325) and Judith Rognlien (8321): Electrodes for Microfluidic Apparatus

Michael Borden and Jason Shepherd (both 1421): Method of Modifying a Volume Mesh

Using Sheet Insertion

— Howard Kercheval (844-7842, MS 0165, hkerch@sandia.gov)
After an intensive two-year effort, Sandia's California has become the first organization at Sandia to receive certification of its Environmental Management System (EMS) to the ISO 14001:2004 standard. The audit in September resulted in the recommendation by an independent third-party registrar, NSN International Strategic Registrations Inc., of Ann Arbor, Mich., that the site's EMS be certified to the standard. To retain certification, the registrar will conduct surveillance audits at the site every six months.

The International Organization for Standardization (ISO) is the world's leading developer of international standards. The standards have been implemented in hundreds of thousands of organizations in more than 161 countries. Their standards specify the requirements for state-of-the-art products, services, and managerial and organizational practice.

ISO 14001:2004 is defined as a "generic management system standard" that can be applied to any organization, large or small, regardless of its type of business. It is a system that requires an environmental policy, objectives and targets, programs for implementation, monitoring and measurement, preventive and corrective actions, involvement at all levels, and continual improvement.

The revised form is available from the Forms Management website. There is no requirement for anyone to re-do his or her PMF. The forms manager, Carolyn Romero, 844-1512, mcromer@sandia.gov, is always available for any consultation or assistance in getting the most out of this form and any other form.

Q: Many of us in my department are struggling with the new PMF form. Instructions are very limited, some are wrong, and we're having lots of trouble with it. W hoever designs and publishes these forms needs to understand that all the staff that need to use them aren't experts in the form field skills required in Word. Once designed, the instructions should be correct. A sample of users ought to test and evaluate the forms. With time on our side, not on trying unsuccessfully to use corporate forms, and ending up wasting time designing/modifying our own forms. This needs to be fixed.

Many of us are frustrated with the new Performance Management System (PMF) with this new version. Users will need to pay close attention to where the cursor is before typing. Highlighted and would be overwritten as soon as the text was entered. It would be very helpful to have the existing content is still there, not on trying unsuccessfully to use corporate forms, and ending up wasting time designing/modifying our own forms. This needs to be fixed.

A: Thank you for raising our attention to the issue of usability of the new Performance Management System (PMF) form.

At issue were two things:

The instructions on how to protect and unprotect the PMF, so that the form can be more easily used, were inaccurate. The larger issue was the usability of the "fill-in-cells" — those grayed areas for user input. You reported that you and your coworkers found them frustrating to use and wondered whether they should be there at all.

The fill-in-cells used on the PMF are commonly used in forms where there are fields for input. They can be used with a single row, or they can be filled in, and not tab into fields for titles or instructions. That makes input efficient and consistent, especially for a single use form.

The challenge you have found is that, first, the instructions on the form weren't helpful, and second, were not specific to the types of fields to be filled in, and not tab into fields for titles or instructions. That makes input efficient and consistent, especially for a single use form.

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Al Romig Q&A

(Continued from page 1)

from peer states and potential peer states, non-state actors and terrorism, regional political instability, rising demand for energy resources, and nontraditional alliances. This Strategic Plan recognizes the changing landscape and acknowledges that only a broad-based national security lab can address these problems. In that context, then, our role is to make sure the people who set national policy and operate according to that policy, for example our energy policy, have the technological resources they need to address these problems. That’s a big job, it is an important one, and it is a challenging one.

What keeps you awake at night?

LN: What are your priorities as you think about national security, defined broadly? What keeps you up at night?

AR: When I think in terms of risk and consequence, there are a number of concerns that rise to the top. In the short term I worry about the threat of a major terrorist attack, either on the US, or on an ally, or on our strategic interests. I don’t mean a small-scale attack such as a suicide bomber or a chemical attack. I think we as a nation are fairly well prepared to deal with smaller, isolated threats. But waking up some morning to find that a nuclear weapon has gone off at the Mall in Washington, for example, is something I do worry about. I worry about a major terrorist attack that is reckless enough to use a nuclear weapon. I worry about the threat of near-peer competitors, where a major national power would attack, or begin to threaten us or our interests in some significant way. And I worry about the tenuous nature of global energy supplies and global resources. Much of our energy these days, oil and gas in particular, comes from regions of the world that are politically unstable or geographically problematic. If you look at a lot of our other strategic minerals, they too come from unstable parts of the world. And water scarcity is likely to be a flashpoint of conflict in the 21st century. On top of all that, we have rapid growth in places like India and China, and that puts an additional huge demand on our resources. So we’ve got rising demand around the world coupled with the difficulty of getting the materials. That can become a national security threat.

Finally, I worry about what the nation would do if there was some kind of major natural disaster. We’ve got earthquake structures, another major hurricane, a global pandemic, a tsunami, or a major earthquake. So that’s also on my list of worries, but it’s a different kind of enemy.

LN: Given such a long list of threats, what should Sandia’s role be in addressing them?

AR: We need to ask ourselves how do we support the policy maker, how do we support the treaty negotiator, how do we support the warfighter, operator, how do we support the oil rigger, whatever it might be. If you take a look at the operations and the policy makers and the negotiators, they are not technology creators, so they have to rely on others for technology. You can buy it from industry, you can get it from a lab, or you can get it at a university. And each one of these occupies a unique space. Universities are very good at creating the first nuggets of intellectual thought, the very creative ideas, for example. Small companies tend to be good at finding that little bit of intellectual property and turning it into a product for a niche market. Large companies tend to be good at technology integration. But there’s a gap in the middle. And the gap is taken that creative nugget and building devices that work.

So you need to have somebody to bridge that gap, who can generate ideas, who can do a certain portion of its own very basic research, and who on the other hand can actually build some number of devices for deployment. You want a nuclear weapons stockpile, for example, that is certified to do its job. You want a satellite that is certified to fly in space and carry out a mission. You want a nuclear fuel cycle that is safe and secure — with appropriate proliferation resistance and waste management. So you need to have somebody who can take the really creative ideas and get them to the point where they are ready for maturation in industry, and I think that’s the unique space the Laboratory occupies. Also, and this is important, there are certain R&D activities the nation has chosen to hold solely for its own purposes. An obvious example is nuclear weapons. But there are others. So we have an operating space in this other dimension that you don’t find in industry or academia.

Defining the ITS mission space

LN: What changes at the national level are defining the ITS mission space?

AR: During the latest round of ITS strategic planning, we looked at the dozen or so key documents from government agencies or special commissions that define where we are going as a nation: documents like the Quadrennial Defense Review, the Nuclear Posture Review, and the National Energy Strategy. There’s a strategy for cyber security, there’s a strategy for homeland security, and there’s a strategy for combating WMD, as well. By the way, in some cases we had an opportunity to contribute to some of those documents. Sandia is very well known around the country, and a lot of us have been heard when the strategy was set at the national level. So, as a consequence of a handful of documents, the nation has reconfigured itself to execute those strategies. You saw the creation of the Director for National Intelligence and the Department of Homeland Security. You saw transformation happening in the Department of Defense, and so forth.

And in the past some of our programs tended to grow from the ground up — somebody had a colleague, an acquaintance somewhere, and that allowed us to work on a project. And others were more top down . . . but as these programs grew, and they each grew like their own grapevine in the vineyard if you will, we began to realize that we needed to have a more coherent strategy in the vineyard. So we took note of the changes in national strategies, the changes in the way the government is organized, and we reconfigured internally to match those changes. And so when we let the grapevines and tried to create order, it produced something that is now called Sandia’s Strategic Management Units. They are built and designed to be focused on the customers, yet to be aligned with mission space.

‘Lab is about the right size’

LN: Let’s focus inwardly a bit here. One goal of the Strategic Plan is to keep the Lab roughly the same overall size, but that doesn’t rule out some internal turmoil. As our mission adapts to the changing situation, doesn’t it follow that people will need to change and adapt as well?

AR: If you look at these SMUs which is the Lab’s way of linking its programs is tightly wired to one or a small number of customers.

LN: You mentioned Sandians often play a role in advising national policymakers? What is our proper role there?

AR: As a national security lab, we’re partly responsible for anticipating threats and providing solutions to those threats. So we do have a responsibility to contribute to the national debate. When policies are being formulated, Congress, the Executive Branch, and other policymakers may come to us for answers, and we must be ready to tell them what we think.

‘Lab is about the right size’

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AR: If you go back and look over history, we’ve been around this number of employees for the last 50 years. We think this is the size needed to maintain the capabilities we perceive the nation needs us to have, and from a pragmatic perspective, it’s a size we know how to manage. So the Lab is about the right size. But it’s an interesting bent, at one time it was all nuclear weapons. And now it’s half nuclear weapons and half ITS. So people have adapted over the last 50 years, and we believe our business could be a lot more dynamic because . . .
If you are not careful, the strong desire to manage risk puts you in the position of not wanting to take enough risk. That's also compounded by the fact that historically our roots are in nuclear weapons. The consequences of a mistake in nuclear weapons could be catastrophic, and so that sets a certain standard for risk taking. But risk taking might be highly valuable in some programs. And it is very hard to switch gears.

Differentiating the Labs

As Sandia becomes more industry-like in its approach to business, how will it continue to differentiate itself from companies in order to attract talented people?

At the Center for Integrated Nanotechnology, we have facilities in Area 4 that were built by the DoD 15 years ago or so. We've got the new National Infrastructure Simulation and Analysis Center (NISAC), which was paid for by DOE. And there are opportunities occasionally for that to happen.

But here are two other approaches we are working on: one is not accretive to the Laboratory Transformation, IES [Integrated Enabling Services] in particular, to help us work with different financial systems that will help recover capital out of programs. Second, we need to work with DOE to identify other customers who have enough desire to work with us as a strategic partner that they will help support our infrastructure because it's the right thing to do for them.

Key strategic partnerships

Sandia will play a critical role

DoE laboratories are the only national laboratories in the country that do the engineering of nuclear weapons. That is our job and it is distinctly our job. But there's no doubt in my mind that nuclear weapons will play, for the foreseeable future, a very critical role in the nation's overall security. And there's no doubt that Sandia and the other labs will play a critical role because we're unique. There isn't anyone else in the country that does the engineering of nuclear weapons. That is our job and it is distinctly our job. But I would also say that if you look beyond that, the nation has recognized that the threats to worry about are more diverse than ever.
inside a box inside a box inside a box,” says Doug. Energy absorbers between an outer and inner box will be crushed during the tests as they do their job, and although the package will look damaged, the inner containment boundary is expected to remain leak-tight. This will be confirmed when the test unit is returned to the fabricator, Engineered Products Division, in Carlsbad. Sandians Dave Bronowski (6315), Tom Gallegos, and Terry MacDonald (both 6765) used vacuum testing during the test series to spot-check the performance on an ongoing basis.

Phil Noss, licensing manager and project engineer for the Tacoma, Wash.-based container designer, views the testing as a critical step in a four-year process. The design is based on a French container, called a TN Gemini, with a rigid inner container and an integral overpack structure (see diagram below). “Layers of foam in varying thicknesses and puncture plates with an energy absorbing structure protect the package contents,” he says. Waste won’t go directly into TRUPACT-III, but into a “standard large box” that fits in the inner TRUPACT-III container, Noss explains. The company successfully tested a half-scale version of the container three years ago at Sandia. The process had to be repeated at full scale, however, because the NRC did not accept half-scale leak test results as representative of the full-scale package. The current full-scale package is about two-thirds as long as the original Gemini package, allowing it to meet US highway transportation weight limits, Noss says. He and his colleagues incorporated these changes and other refinements in the current version. It was fabricated beginning earlier this year in Carlsbad, under a strict quality assurance regime. Preliminary load testing and leak testing to establish a baseline also occurred in Carlsbad before the container was shipped to Albuquerque for testing.

Marc Italiano, project manager for DOE at Carlsbad, says the containers will be used to move 5- by 5- by 8-foot boxes, containing items such as cut-up glove boxes and other odd-shaped materials from the weapons complex that will not fit into 55-gallon drums. “This will be waste from the old weapons program . . . byproducts from production, maintenance, and disposal,” says Italiano. “Most of it fits in 55-gallon drums and that’s what we use, but there is also a lot of big stuff that won’t fit.” Many items in 4- by 4- by 7-foot boxes and quite a few in 5- by 8-foot boxes remain at DOE’s Idaho, Savannah River, Hanford, and Los Alamos sites.

By using TRUPACT-III, we don’t have to size-reduce the stuff, which is a very complicated engineering feat,” Italiano says. Size reduction work is expensive and can involve using robots or workers dressed in protective gear. With NRC approval, TRUPACT-III can begin to move wastes to WIPP, he says.

Before gaining NRC approval however, Noss and others at Packaging Technology will write a Safety Analysis Report. The testing process, quality assurance information, and test data will be part of the SAF. Fire testing data is being provided by computer modeling and simulations rather than in a physical fire test, Doug says. NRC officials will then review the report before making a decision on the certification of the container.

“We had a big decision about where to test initially,” says Noss. “We had considered testing at Oak Ridge and also in France. But because of the size and the complexity of the container, Sandia became the choice.”

**TRUPACT-III test rattles canyon**

(Continued from page 1)

**Test Capability Revitalization a boon to testers**

A comparison of half-scale testing of TRUPACT-III several years ago with the just-completed series of full-scale tests at the Aerial Cable Site is illustrative of the impact of a Sandia project called TCR. Test Capability Revitalization has made a world of difference to the tech-nologists, engineers, and their customers working on tests at this site.

Two chiller units, wired to “house” electricity — instead of relying on noisy, and sometimes finicky, portable generators — easily pumped out refrigerated air sufficient to cool the giant TRUPACT-III test package to minus 40 degrees F in just a couple of days, reports Jamie Arnold (1334), who oversaw site operations for his crew of four and other support personnel. Newly installed power also provides the juice for Sandia’s MIDAS trailer, used to gather a suite of data within minutes of actual testing. Both MIDAS and the control room, down the road from the site in Bldg. 9838, benefit from a complete refitting of data acquisition cables at the site.

In the old system, signals were occasionally dropped due to the deteriorating cables, says Jeff Cherry, manager of Mechanical Environments Dept. 1334. When a rocket sled is used to pull down a target from the newer, high-capacity overhead cables, or when explosions are involved in a test at “ground zero” at the site, test personnel can safely retreat to Bldg. 9838 and get quality data with the new fiber optic system, Jeff says.

Coming and going are better, too. A road upgrade means that mud in bad weather won’t be the obstacle it has been in the past. “We replaced things that were aging, doubled the weight capacity of the aerial cable, and achieved our purpose in extending the life of this facility,” Jeff says.

**The SEQUENCE of photos on this page of the TRUPACT-III drop test represents a total time interval of one second. Lab News photographer Randy Montana captured the moment in burst mode on a Nikon digital camera. In the photo at upper right, also by Randy, project manager Doug Ammerman shows team members where they should deploy during the test. In the background of the photo, the TRUPACT-III test package is still inside a special refrigeration system designed to cool the unit to minus 40 degrees F prior to the drop.**
DS&A SMU applies rich legacy of engineering, science, and technology to today’s most pressing national security challenges

Work for defense, other national security communities now a mainstay of Labs’ ‘exceptional service in the national interest’

Story by Julie Hall
Timeline on pages 8-9 by Laura Scott • Photos from Sandia archives

The formation of the Defense Systems & Assessments strategic management unit last year from the merger of the Military Technologies & Applications SMU and most of the Nonproliferation and Assessments SMU represents the latest chapter in a long history of the Labs’ national security work for agencies other than DOE.

From its humble beginnings in 1950, Sandia’s military work for others (WFO) has grown to represent the majority of its “work for others” funding and a mainstay for the Laboratory, where once it was considered peripheral, even controversial, by some who thought Sandia should stick to its core business — nuclear weapons engineering.

Today it represents a growing line of business for Sandia at a time of declining nuclear weapons funding. The 2005 reorganization put most of Sandia’s work for the Department of Defense and other national security agencies in the DS&A SMU, with the goal of further enhancing the management and growth of this work.

‘As if we’ve awakened from a deep sleep’

“The work that we’ve done for other federal agencies [besides DOE] has historically been at a relatively small level, a fraction of what we do overall at the Lab,” says DS&A VP Jerry McDowell. “Today, it’s as if we’ve awakened from a deep sleep to discover we’re a much larger piece than we were in the past . . . so the management of the work that we do deserves more rigor and more interaction at the national level than we’ve probably ever done before.”

Sandia’s military WFO represents about 80 percent of DS&A’s budget. In FY06, DS&A managed $490 million, or 65 percent, of the Labs’ $759 million WFO funding. DS&A’s WFO work is expected to continue to grow in coming years, with FY07 projections bringing it to 71 percent of total WFO.

The history of military WFO at Sandia is studded with numerous high-profile programs and accomplishments, such as work on the VELA satellite program in the 1960s, development and testing of reentry vehicles spanning four decades, the invention of the clean room, arms control and treaty verification work, and development of numerous technologies used in conflicts in Vietnam, Bosnia, Afghanistan, and Iraq.

In many WFO projects for defense community customers, Sandia typically plays a supporting role, a small but integral cog in a bigger machine.

“Is there a Sandia thunderbird stamped on the side [of these various systems]? No,” Jerry says. “We have contributed key parts and components and in that spirit we’re part of a team that serves the interest of the defense community, and that’s the theme that pervades everything we do.

“Sandians, both past and present, have to get satisfaction in knowing they influenced a system,” he says. “We’re likely not to be known as having created a system — we don’t do operations work. But we can take tremendous pride in serving as supporters of the guardians of peace and freedom.” (Continued on next page)

PRESIDENT JOHN F. KENNEDY visited Sandia in 1963, at the height of the Cold War. On his itinerary was a quick briefing about the VELA satellite package, designed at Sandia to detect atmospheric nuclear detonations. In the Kennedy delegation were McGeorge Bundy, center background, and Glenn Seaborg, chairman of the Atomic Energy Commission, DOE’s predecessor organization. At right is Sandia Labs President Monk Schwartz.

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• Defense Systems & Assessments Strategic Management Unit •
Relationship with military an enduring part of Sandia's mission

Defining WFO

Many people think of WFO as "nonnuclear" work, such as work for the Nuclear Regulatory Commission or the Department of Homeland Security. But all of Sandia's military WFO traces its roots to capabilities developed through the nuclear weapons program.

"I know of no venue that we are involved with today in the defense and national security community that isn't directly related to another weapons activity in some way," Jerry says. "Our ability to help these customers has flowed from the investment in the engineering, science, and technology capabilities that underpin the nuclear weapons program."

The widely accepted definition of WFO focuses on the funding source: Basically, any work funded by an agency other than DOE/NNSA is considered to be WFO.

While not disputing the close ties between military WFO and nuclear weapons work, retired Sandian Jerry Allen also sees a reciprocal benefit between the two types of work.

"There's another side of the equation that says . . . the weapons program is greatly helped by the WFO program," says Jerry, who co-founded both weapons and WFO programs at Sandia. "In other words, we couldn't do what we are today had we not had the WFO program because it provided the funding to develop these capabilities which are used in the weapons program."

A controversial program

WFO started inauspiciously in 1950 with Sandia's first "reimbursable" project. With the Atomic Energy Commission's permission, Sandia received money from the Defense Department to study nuclear weapons effects. The weapons in existence at that time were too large to compare to later designs, and the military wanted to understand their effects on adversaries.

When this first and the Soviets agreed to suspend nuclear testing in 1958, many worried about its impact on Sandia and its funding. Sandia managers began to explore branching out into other areas. The Lab's early opportunities to diversify came from its partner laboratories requiring engineering assistance for non-nuclear projects. In 1963, Sandia President Monk Pratt identified a small directorate to examine a variety of potential work for Sandia.

By 1976, reimbursable projects funded by other agencies had grown to approximately 50 million, or 18 percent of Sandia's $280 million budget at the time. The growth was spurred in part by a concerted effort on the part of Sandia President Morgan Sparks, and later by his successor, George Dacey, to cultivate new business and new sponsors in the wake of nuclear testing's end.

Despite the funding boost the programs provided, in the 1980s a cadre of people—enshrined forever—opposed a WFO program, says Jerry, calling it "distracting" to Sandia's core mission. Some supported the program, viewing it as "insurance" against what they saw as inevitable nuclear weapons funding declines and fought not only to keep the program but to expand it.

"I can remember many arguments about whether the satellite program ought to be any kind of mainstay for the laboratory," Jerry says. Much of that perspective was driven by the desire to keep the laboratory small and lean. Among those who had gone through the painful layoffs of 1975 of taking on a program where funding could fluctuate by year. With nuclear weapons funding, Sandia had a year or two advance notice on funding based on congressional appropriations, but in the WFO program, "they [the customers] don't have to come back to you . . . We used to say we earn our bread every year," Jerry says.

"It took a lot of the Roger Hagengrubers and Jerry Yonases to say 'Look, industry can manage those kinds of things and so can we. Do we provide exceptional service to the nation only through the nuclear weapons program or do we take some risks?'" Roger (ret.) led Sandia's national security work for others efforts in the mid-1980s. In 1993 the DoD portion was split off and assigned to Jerry, now 2000 vice president and principal scientist.

WFO eras

Placed on a timeline, Sandia's major military WFO efforts would mirror capabilities developed at Sandia from the nuclear weapons program, says Jerry McDowell. "It was always deliberately our intent that work we did for the military or national security community drew on the fundamental capabilities of the laboratory that were part of the nuclear weapons program because doing so exercised them and made them stronger," he says.

Early on, WFO focused on technology and in the Cold War thawed and eventually ended. Sandia provided not only technologies and hardware but also consultants. (Continued on next page)
Anticipating, addressing strategic threats to the nation

(Continued from preceding page)

Sandians participated in managing and advising on treaties that involved nuclear, chemical, and biological weapons all over the world. In several instances, Sandians, such as Paul Stokes, Roger Hagengruber, and Stan Fraley, were directly involved in treaty negotiations in Geneva and the Soviet Union.

“Sandia recognized this obligation as a part of its custodianship of the stockpile. Custodianship doesn’t just mean you make them [nuclear weapons] reliable and safe and secure,” says John Taylor, manager of Integrated Technologies & Systems Strategic Planning. John joined Sandia in 1975 and began working in nonproliferation starting in 1983. “It also means that you understand that controlling them is an international obligation and you work to do that responsibly.

“I think we can be justifiably proud of this work because it reflects the real classic case of what I consider ultimate custodianship and that is, we build these weapons but we also understand that you have to work to eliminate them in a reasonable and appropriate way.”

Technologies such as development of the laminar airflow clean room grew out of internal needs that could not be met by technology available at the time. The advanced manufacturing group needed a way to remove dust that might contaminate close-tolerance weapons parts. Willis Whitfield had the idea to use a uniform flow of filtered air from the ceiling to the floor, or wall to wall, to remove dust from the air. His idea, which was patented in 1964, became the foundation for the $1.2 trillion electronics industry, according to figures from SEMATECH.

Sandia’s current research on synthetic aperture radar and automatic target recognition can be traced back to Sandia’s work on radar fuzes and advanced navigation, guidance, and control systems for missile-delivered nuclear weapons applications. Sandia-developed SAR systems and image processing techniques are routinely deployed around the world in high-profile military operations and have operated under every US military command. Key Sandia findings that have pushed the envelope in SAR technology include advances in real-time, fine-resolution image formation and autofocus, fine-resolution 3-D terrain mapping, and leading-edge data exploitation techniques such as the detection of ultra-fine changes in the surface of the earth.

Another longstanding program comes from the Conventional Munitions Memorandum of Understanding (MOU), signed in 1985 between DOE and DoD. The MOU provides a funding mechanism for NNSA and DoD labs to jointly pursue R&D for advanced conventional munitions technology. DoD funds are matched by DOE, effectively leveraging DOE/Sandia expertise and funding. Sandia is slated to receive $14 million in FY07 through the MOU.

“It has allowed us to work collaboratively… on munitions technology of interest to both agencies,” says DSSA Deputy David Keese. “It’s an excellent example of cross-agency collaboration.

Looking to the future

Jerry McDowell says the DS&A 9MU is at an “interesting junction.” While nuclear deterrence remains the principal strategic national security challenge for the US, the DoD and elements of the national security community are undergoing intense restructuring and transformation in response to changing strategic national security threats. For example, one of US Strategic Command’s (STRATCOM) mission areas is developing new ways of protecting the nation’s information infrastructure from cyber threats.

Sandia is helping the military assess and counter the threats these computer systems and networks face. “We have a rich understanding of vulnerabilities to computer networks because we have historically worked and continue to worry about use and misuse of nuclear weapons,” Jerry says.

“Defensive counter-space” as it applies to protecting US satellites is another emerging mission area for STRATCOM in which Sandia is involved. This might take the form of a lunar laser warning system, for example, that would detect an adversary shooting a laser at a satellite. This could disable or confuse the satellite, potentially affecting precision-guided munitions and global-position systems used by soldiers.

“Our military capability depends a lot on our space assets and so if you destroy or deny their use you hinder the military’s ability to execute its mission,” says Andy.

Sandia will continue to build on its legacy of success in anticipating, understanding, and addressing such challenges, says Jerry.

“The tradition we’ve always turned to and will continue to turn to is to anticipate the strategic threats our nation faces, to rely on our rich science and technology community to create new ideas and discover new capabilities, to challenge our engineers to convert that technology into something useful and innovative for our customers, and to be engaged throughout the national security community in helping inform the national debate on security choices, because technology enables a whole new way of thinking about our future,” Jerry says. “The DS&A 9MU is at the forefront of meeting these new challenges and as this work grows, the DS&A will increasingly be called upon to establish relationships with the defense and national security communities that strengthen investments in science and technology, and Lab infrastructure. This is a great time to be at the Lab and to be involved in the work of the DS&A 9MU. As the motto on our seal says, we are the new order for the ages.”

SANDIA’S SYNTHETIC APERTURE RADAR has become a must-have tool for the nation’s military. The photo above, of a small section of the Rio Grande Valley, only begins to suggest the capabilities of this technology, which can image terrain through cloud cover, at night, and in real-time. Sandia continues to refine the technology to meet 21st-century national security threats.

• Defense Systems & Assessments Strategic Management Unit •
By Will Keener

For a species of “eco-shapers” who will create more radical change in the next century than has occurred since the last Ice Age, Noel Brown has some bad news and some good news. The bad news is that while we are making plans to explore the universe, we are on a track to be the world’s “terminal generation, without fully understanding how the Earth works.” The good news: We have the power to project and create a very different, positive future.

Brown, former regional administrator for the United Nations and an expert on the global environment, was keynote speaker at the fall quarter Environmental Management System Awards ceremony Oct. 25 at the Steve Schiff Auditorium in Albuquerque. “We can anticipate a desired state of affairs and shape the future before we actually experience it.”

Brown told his audience, which included a video link to California and video-streaming to desktop computers around the Labs.

As the first generation of humans to actually perceive Earth as a whole, the current generation of scientists and researchers has a responsibility to build a culture of sustainability. If we don’t kill ourselves accidentally or intentionally, there is very little we cannot do,” he concluded. “It is too late to be pessimistic.”

More powerful storms, dust storms, changing rainfall patterns, and other factors could create shifts that would damage the valuable coastal agriculture lands, with their easy access to most of the Earth’s population. “Acre for acre, the coastal system is the most productive on Earth,” he said. Right now just 11 percent of total land area is the basis of the world’s food supply, Brown noted.

Brown praised Sandia’s efforts in environmental protection and waste minimization (see “Environmental Management System Excellence Awards” below) and pointed out a number of positive collaborations under way throughout the world. He praised an alliance of BP, Amoco, GM, and Monsanto, who have agreed to report generation of greenhouse gases and work to reduce them on a voluntary basis. “Clearly, these businesses see an economic value in creating a sustainable future.”

Brown called for more incentives for sustainability in the marketplace and challenged his Sandia listeners to “create a research agenda to anticipate a desired future, positive future. Have the power to project and create a very different, positive future.”

The winners:

Projects for replacement of hazardous solvents with vinegar, protection for migratory birds, and saving money with waste minimization approaches were named winners in the third quarter 2006 Environmental Management System Excellence Awards, given Oct. 25.

About 20 team and individual nominations were received, involving about 168 people, including several from Kirtland Air Force Base, said Jack Munner, Pollution Prevention (10331) team leader at Sandia. Nominees were from California, New Mexico, and the Pantex site in Texas. “The quality of the nominees was excellent,” Jack said in announcing the awards. “It was challenging to pick just four winners.”

The winners:

Manny Trujillo, 2453-1, won the individual award in the Risk Mitigation/Environmental Protection category for his efforts to replace hazardous solvents with simple household vinegar in cleaning processes in his lab.

The individual award winner in the Waste Minimization category was Gary Tilley (1342) for HERMES III waste minimization practices. His approach to waste minimization will save thousands of dollars at the HERMES facility.

The team award recipients for the Waste Minimization category were Phillip Cole (2453), Shannon Lacy (2453), Sean Winters (1821), and Joe Lenhart (1821) for their efforts in reducing solvent use. Reductions in materials purchased and disposal costs are estimated at $9,500 per year from the project.

Fourth-quarter EMS nominations are being accepted through Dec. 31, in the categories of Water Conservation and Energy Reduction.

Vinegar in cleaning processes in his lab. The hazardous solvents with simple household protection category for his efforts to replace hazardous solvents with vinegar, protection for migratory birds, and saving money with waste minimization approaches were named winners in the third quarter 2006 Environmental Management System Excellence Awards.

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Sandia’s Jerry Simmons helps lead way to new form of lighting

By Chris Burroughs

A revolution is underway. And no, it’s not in some small, unstable nation.
Indeed, it’s in the way the world will soon light houses, office buildings, and schools.
Predicis Sandia researcher Jerry Simmons (1130), "By the year 2025, all incandescent light bulbs will be in museums, with solid-state lighting (SSL) being the main light source."

Jerry has been a champion of SSL and semiconductor-based light-emitting diodes (LEDs) ever since he became manager of Sandia’s SSL program. He worked on two-dimensional electron systems in the Semiconductor Material and Device Sciences Department for 10 years after joining the Labs in 1990 with a new Princeton University PhD in electrical engineering.

Solid-state lighting systems consist of LEDs made of semiconductors – the crystals used in computer chips. LEDs use no hazardous materials, last as long as 100,000 hours, and have the potential to be far higher in efficiency, producing less waste heat than conventional lighting.

After being tapped to become manager of the same department in 2000, Jerry’s first job was to write an in-house Grand Challenge funding proposal for improving LEDs through Sandia’s Laboratory Directed Research and Development (LDRD) program. He discovered his passion.

"I had to learn fast," Jerry says. "But the idea of SSL got me really excited, and I had a lot of patient instruction by expert staff."

Over the past six years, this enthusiasm led Sandia to become a worldwide leader in LED development. He even traveled with Sen. Jeff Bingaman, D-N.M., to Japan and Taiwan to learn about those countries’ SSL research and energy policies.

Most recently he led a team that wrote the winning proposal for a DOE virtual Center for Solid State Lighting Research and Development requirements.

"I see this center as a bridge between fundamental discoveries at DOE Nanoscale Science Research Centers and companies that will take these ideas and make them into usable products," Jerry says.

Sandia manager takes alternative route to successful career at Sandia

While forging ahead to make Sandia a world leader in the areas of solid-state lighting (SSL) and semiconductor-based light-emitting diodes (LEDs), Sandia researcher Jerry Simmons (1130) has a whole other job. In 2004 he assumed the position of senior manager in charge of Sandia’s DOE Basic Energy Sciences/Materials Science research program at Sandia, inheriting the responsibility from George Samara (1130), now senior scientist, who left to teach and to study anthropology and philosophy.

It’s a position that seemed quite unlikely for the young researcher who never graduated from high school or got a GED, Jerry left high school after his junior year and never went back. Instead, he took an alternative route and participated in an early-entrance program at a small college in New York City, the New School for Social Research, with a program for students skipping their senior year in high school. Few science courses were available, so he took up anthropology and philosophy.

Wanting more adventure, he moved to Wales, where he briefly attended school. Jerry then returned to the New School and soon transferred to another alternative college in Florida (New College of Florida) where he began studying science seriously again. Jerry says it was probably the best educational decision he ever made.

"The school had no grades or course requirements," Jerry recalls. "And because of that, it let me focus intensely on projects — something I do to this day."

After receiving undergraduate degrees in physics and philosophy, he went to work as a technician for two years at Bell Labs in Murray Hill, N.J., where he became acquainted with a scientist, Dan Tsui. The scientist left to become a professor at Princeton, and Jerry asked if he could be his student. Jerry followed Tsui to the Ivy League school, where he obtained his PhD in electrical engineering. He subsequently moved to Albuquerque to work at Sandia.

"Sandia was the only permanent job I applied for. I wanted to work somewhere that had growth opportunity," Jerry says. "Plus I liked the New Mexico outdoors."

Jerry continues correspondence with Tsui, who in 1998 won the Nobel Prize for physics. Tsui consults at Sandia, visiting about three times a year, and has collaborations with Sandians Wei Pan (1123), John Reno (1132), and Mike Lilly (1212).

Jerry recalls one funny incident that occurred just as he was finishing his PhD and preparing to join Sandia. Shortly before graduating from Princeton, he called his old high school to ask them if they would finally give him a diploma. "They said no," Jerry says. "They said I had to take a GED test. Well, I didn’t."

—Chris Burroughs

Sandia holiday tradition . . .

A Sandia holiday tradition . . .

Manager promotions

New Mexico

Betty Biringer from DMTS, Office of Counterintelligence Dept. 0301, to Manager, Security Risk Assessment Dept. 6441.

Betty began her career at Sandia as a One-Year-on-Campus (OYOC) student intern in June 1974. Since then she has been either an employee or contractor.


Betty has a BS in mathematics from New Mexico State University and a master’s in mathematical sciences from Rice University in Houston, Texas.

Randi Watkins from PNTS, Lab Science, Technology, and Engineering (ST&E) Business Office Dept. 1010, to Manager, ST&E Strategy and Technology, and Engineering (ST&E) Business

Randy began his career with Sandia in 1983 when he worked in the Glass and Ceramics Processing Department. In 1991, he transferred to the Energy and Environment Department working on environmental life-cycle analysis and impact assessment. In 1995 he moved to the Defense Programs Studies Department and worked in systems analysis until 2004. Randy has worked in the ST&E Department in a variety of roles, now focusing on ST&E strategy development, risk review, LDRD Strategic Planning, investment area management, technical capabilities assessment, and the Laboratory Management System.

Randy has BS and MS degrees in ceramic engineering from Ohio State University.

Jose Zayas from DMTS, Wind Energy Technology Dept. 6333, to Manager of that same department.

Jose has been in the Wind Energy Technology Department since 1996 and has centered most of his research on the areas of sensors, actuation, dynamic control, wind turbine dynamic modeling, data acquisition systems, and field testing.

He has a BS in mechanical engineering from the University of New Mexico and a master’s in mechanical and aeronautical engineering from the University of California, Davis.
LDRD Day highlights new research directions
Posters, presentations show research with wide impact

By Neil Singer

The LDRD mission
From the LDRD external website home page:
Sandia’s value as a national resource is its world-class science, technology, and engineering. These capabilities must remain on the cutting edge because the safety, security, and reliability of US nuclear weapons depend directly on them. Under the guidance of Sandia’s Laboratories Director and with the DOE’s concurrence, the Laboratory Directed Research and Development (LDRD) Program provides the flexibility to invest in long-term, high-risk, and potentially high-payoff research activities that stretch Sandia’s science and technology capabilities. LDRD supports Sandia’s four primary strategic objectives: nuclear weapons; nonproliferation and materials safeguards; energy and critical infrastructure; and emergent national security threats. To meet these objectives, the LDRD mission is to enhance collaboration between staff, and provide the flexibility to invest in long-term, high-risk, leading-edge R&D with the potential for high-payoff research activities that stretch Sandia’s science and technology capabilities.

Research and Development (LDRD) Program provides the flexibility to invest in long-term, high-risk, and potentially high-payoff research activities that stretch Sandia’s science and technology capabilities. LDRD supports Sandia’s four primary strategic objectives: nuclear weapons; nonproliferation and materials safeguards; energy and critical infrastructure; and emergent national security threats. To meet these objectives, the LDRD mission is to enhance collaboration between staff, and provide the flexibility to invest in long-term, high-risk, leading-edge R&D with the potential for high-payoff research activities that stretch Sandia’s science and technology capabilities.

by being the first to show that such architecture was feasible.

• Ann Speed (6341) and her group compared a Sandia-developed method with a method widely used at universities to track a driver’s reactions in terms of driver brain function and data from the car itself. She found the Sandia method able to handle far more data — a more useful characteristic in real-world domains than the simpler laboratory tests performed at universities.

• Michael L. Bernard (also 6341) and his group created a model of how humans react in relatively unstructured situations, rather than the prevalent scripted behaviors that fall apart when scenarios change. The dynamic simulated environments allow for better virtual training environments.

• Thomas Mattsson spoke on his work with Mike Desjarlais (both 1674) that changed the known range of electrical conductivity of water and rearranged its phase diagram.

• Chris Apblett’s (1723) poster covered a 2-year grant to develop small, long-term alternatives to chemical batteries. His group developed one the size of three Lifesaver candies that will last 75 years.

• Anuph Singh’s (8321) poster discussed how cells respond to being infected, using microfluidic tools and hyperspectral imaging to see how proteins move in cells. The group found previously unpredicted interactions that “would have taken legions of graduate students to collect data” without such capabilities, said Chris Apblett, monitoring the poster for Anuph, who was away.

• Tom Friedmann (1114) created thin-film gauges intrinsically connected to target materials in shock physics experiments. They are designed to minimize intrusions by the measuring device on pressure readings, and allow for the first time an accurate, direct measurement of temperature.

• Julia Hau’s (1114) poster read that she had explored new approaches for nanomaterials assembly and demonstrated some success in using organic molecules to control surface energy. Six awards for projects ending in the past three years were given across the self-evident LDRD themes of Discover, Create, and Prove. They were also shared equally across the two major LDRD program areas of Science, Technology & Engineering and Mission Technologies.
In safety-focused organizations, shouldn’t ‘ridiculously hazardous footwear’ be banned? And, can’t someone please foil carpool parking spot thieves?

Q: Now that the powers-that-be have banned handheld cell phones so we can drive safely; banned gazing at the scenery so we can walk safely; and banned smoking so we can breathe safely, are they also going to ban spike heels and platform shoes so we can walk safely?

This is not a frivolous question. Slips, trips, and falls are uppermost in the minds of those who worry about ES&H and are arguably the single largest source of non-construction site injuries on the campus.

In particular, it seems the pebble-filled terrazzo material of which our mall walkways are made is particularly good at catching the tip of a spike heel, but the solution seems to be to remove the terrazzo material, not the shoes. The diggers and fillers are doing exactly that, right now, at the northwest corner of Bldg. 878. At what cost? At what expense to the campus’ esthetics? And only so people can continue to wear ridiculously hazardous footwear?

A: Employees are required to wear clothes appropriate to the work environment. In addition, both employees and their managers should use good judgment. If certain shoes create a safety issue, they should not be worn in the working environment. Some common sense is required in this situation.

— Phil Newman (10300)

Q: Can anything be done about people who continue to park in carpool parking without permits? Half of the carpool spaces north of the cafeteria and north of Bldg. 887 are regularly used by non-carpoolers.

A: The Protective Force has been issuing citations in the area you mention on a daily basis. Since the new parking regulations program went into effect, we have not had any repeat offenders ticketed in that area. Apparently employees aren’t getting the message that we are serious about ticketing parking violators. We will continue to monitor this area. Please call the Security Desk Lieutenant at 844-3155 to report any parking violations and they will respond if an officer is available.

— Willie Johns (10322)

Sandia Traffic Safety Committee
Chris Cornelius (6338) says he was not much of a student in high school. He was one of the few Native American students in his school at that time. Chris recently received the Technical Excellence Award from AISES (American Indian Science and Engineering Society). “As my family grew, Chris says, “I aspired to move from bagger to cashier at our local supermarket. My store manager always told me that there were no openings, but he continued to hire from outside. This did not discourage me and with the help of an assistant manager I became a cashier. After training, I was the fastest cashier in Billings and people waited in my line for me to help them out. That was back in the days paper sacks were used.”

With a growing family, Chris tried for a management position, but he realized that he would never be given an opportunity and decided he needed to change his path and attend college. He enlisted in the Army Reserve as an X-ray technician to qualify for the GI Bill so he could attend school. He continued working for the grocery store until he earned a summer internship and scholarship with the NRCURS (Northwest Colleges and Universities for Science) program at Pacific Northwest Laboratory. With AISES and NRCURS scholarships and with the help of the GI Bill, he never returned to his cashier job. He became a full-time student at Montana State University (MSU) and majored in chemical engineering. Chris’s interest and understanding of organic synthesis at MSU came from his work with Professor Bradford Mundy. He spent several summers synthesizing, purifying, and characterizing monomers in Mundy’s lab. Chris’s success in this area had Mundy calling Chris the guy with “magic hands” because he was able to synthesize a monomer a graduate student failed to do.

Chris worked for Dow Chemical for a year and a half before and after graduation. As a research engineer he was in charge of the development of polyolefin copolymers and terpolymers. He left Dow to work for the 3M company as a process engineer before deciding to go back to school.

He attended Virginia Polytechnic Institute and State University in Blacksburg, Va. Chris was the first Native American to graduate from both MSU’s and Virginia Tech’s chemical engineering PhD programs with honors.

Chris came to Sandia in July 2000 and has worked as a principal investigator in several technical areas. At Sandia he leads a team in the development of fuel cells for clean power. Chris is also doing research in improved water desalination and works on the development of new polymers and composites for myriad applications.

Realizing the importance of education, Chris volunteers in community programs that help minority students understand the importance of hard work, perseverance, and education. “I like students to know that they have a tremendous potential for success and only need to realize it,” says Chris.

Last year Chris developed a class for high school students. The class, based on surface science, is taught through the use of bubbles, exploring the nature of why they are round.

Activities during November – American Indian Heritage Month

Jemez Feast Experience
Sunday, Nov. 12, 8 a.m. to 4 p.m. Buses will transport at no cost up to 150 participants from KAFB to Jemez Pueblo and back (first come, first serve). Enjoy traditional dancing, feasting, and socializing with the people of one of New Mexico’s 19 tribal pueblos. Contact Valerie Renner at 846-8940 to reserve your seat.

Annual Luncheon
Thursday, Nov. 16, 11:30 a.m. to 1 p.m. at the Mountain View Club. Arnold Herrera (Cochiti Pueblo) an accomplished drum maker, composer/singer, and teacher of culture to all audiences, will be the keynote speaker. Tickets for $8.50 per person are available from John DeBassige at 284-9693 or Marie Brown at 284-3171.

American Indian Heritage Month

SANDIA PUEBLO Headstart traditional dancers kicked off the American Indian Heritage Month celebration at Hardin Field Nov. 3. Jingle dress dancers, traditional dancers of fancy shawl, and grass dancers were among others bringing a beautiful day to life.

American Indian arts and crafts and traditional foods were available. Florence Loretto (2112) prepared most of the food served to the more than 200 attendees.

For more information on upcoming events, see box at bottom left of this page.