

Labs Director Paul Himmert announces retirement

Process to name successor 'well underway;' smooth leadership transition expected in mid-summer

Sandia President and Laboratories Director Paul Himmert announced to employees on Tuesday that he plans to retire in mid-summer, five years after becoming Sandia's 13th director.

Under Paul's leadership, Sandia has delivered on a wide variety of national security work and increased its already large economic and community impact on Albuquerque and the region through the Labs' technology transfer, small business programs, employee volunteerism, and donations.

"The technical performance of our institution on a range of products in the nuclear weapons program has been outstanding," Paul said. "Sandia has made game-changing technical contributions to a wide range of national security programs, as well as diverse and sustained contributions to international security. Sandia has continued to bring its scientific and engineering depth to solving dynamic challenges in energy security. All these accomplishments and others form the basis of the Laboratories' future.

"The process to name my successor is well underway and will be complete in time to support a smooth leadership transition," he said. "The timing for my retirement is consistent with commitments made to the Sandia Board of Directors and my family when I accepted this position some five years ago."

Paul also noted that Sandia has met budget and schedule goals for an unprecedented three major nuclear weapons update projects, including the B61-12 Life Extension Project.



PAUL HMMERT

"Under Paul's leadership, Sandia has excelled in carrying out research and development to ensure America's economic and technological competitiveness while advancing key initiatives across the nuclear security enterprise," said Secretary of Energy Ernest Moniz. "Paul has promoted innovative approaches to new and challenging scenarios. I want to thank Paul for his many years of service to Sandia and dedication to our nation."

In an internal memo to employees, Paul reflected on his years of service at Sandia.

"As I look back on my career, I have been truly blessed to spend so much of it at this great institution, among such talented and dedicated people," Paul wrote. "Preparing for the next phase in my life, I know that I will take pride in your future accomplishments for I will always be a Sandian."

Since Paul became Labs president and director in 2010, Sandia has experienced mission growth and a workforce increase to more than 10,000. And employee contributions to the United Way and volunteer work for dozens of worthwhile local causes have steadily increased.

In 2013, Paul was named Laboratory Director of the Year by the Federal Laboratory Consortium for his support of Sandia's technology transfer activities. The award recognizes federal laboratories and their industry partners for outstanding technology transfer efforts and has become one of the most prestigious honors in technology transfer.

Paul began his career at Sandia as technical staff member in 1976 and moved into positions of increasing program and management responsibility. He later served in leadership positions at the Atomic Weapons Establishment in the United Kingdom and at Los Alamos National Laboratory. He returned to Sandia as VP of Sandia's California site in 2006 and was named executive VP and deputy laboratories director for the Nuclear Weapons Program in 2009.

Domenici: 'Government R&D and the shale boom'

In a guest column for the *Sandia Lab News*, former US Sen. Pete Domenici writes about how smart federal investment in R&D coupled with robust private sector partnerships contributed to the ongoing shale oil boom. Read his analysis on [page 6](#).



Sandia Lab News

Vol. 67, No. 9

May 15, 2015

Managed by Sandia Corporation for the National Nuclear Security Administration



Starving a cancer instead of feeding it poison

Simulation offers hope of killing cancers without sickening patients



SUSAN REMPE is part of a multi-institution research team exploring a new approach to fighting cancer that avoids many of the side effects of current treatments. (Photo by Randy Montoya)

By Neal Singer

A patent application for a drug that could destroy the deadly childhood disease known as acute lymphoblastic leukemia — and potentially other cancers as well — has been submitted by researchers at Sandia, the University of Maryland, and the MD Anderson Cancer Center in Houston.

"Most drugs have to go inside a cell to kill it," says Sandia researcher Susan Rempe (8635). "Our method instead withholds an essential nutrient from the cell, essentially starving it until it self-destructs."

(Continued on page 6)



Early Career research award

Christopher Kliever wins \$2.5 million DOE Early Career Research Program award. Story on [page 3](#).

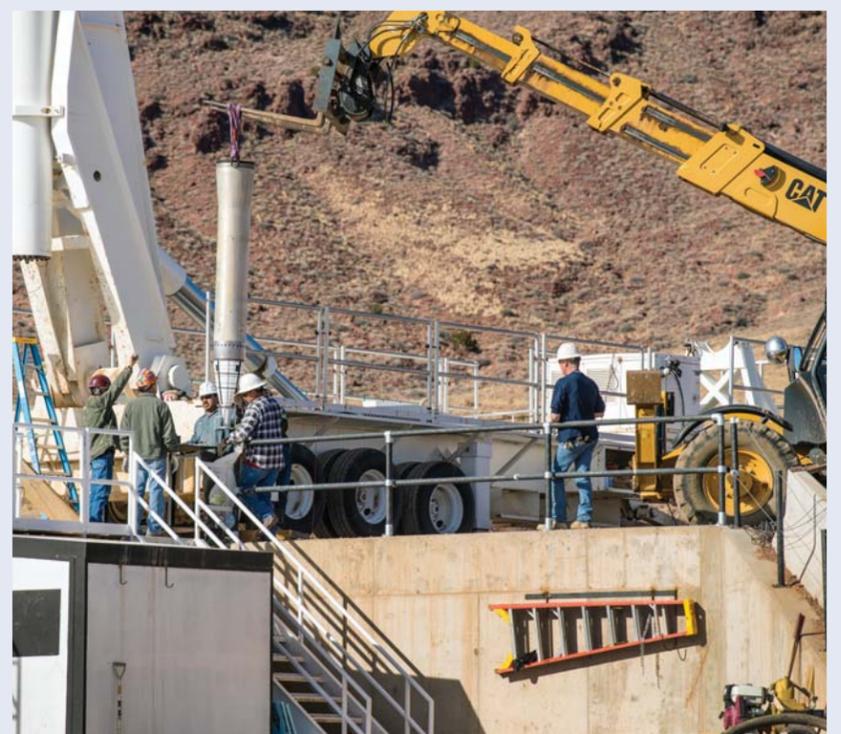


Ken Holley honored

Ken Holley honored by New Mexico state Office of African American Affairs. Story on [page 7](#).

Davis gun tests aid B61-12 LEP

'Awesome' test culminates years of work



THREE YEARS OF DESIGNING, planning, and preparing came down to a split second, a loud boom, and an enormous splash in a successful impact test of hardware in the nose assembly of a mock B61-12 bomb. For the full story by Sue Major Holmes and photos by Randy Montoya, see the spread on [pages 4 and 5](#). (Photo by Randy Montoya)



Memorial Day 2015



Sandian's son remembered as a soldier who loved life

Story on [page 8](#).

That's that

When I heard that Paul Hommert plans to retire later this summer, one of the first things I thought about was the movie *Apollo 13*.

That may seem like an odd bit of free association, so let me explain. Or rather, let Gene Kranz, the Apollo 13 flight director (as portrayed by Ed Harris in the movie) set the stage: Three astronauts are stranded in a seriously damaged spacecraft a quarter of a million miles from Earth. It looks like their life support systems may fail long before they can get home. The situation is just about as bleak as it can be.

In the movie, Kranz overhears one NASA official say to another. "This could be the worst disaster NASA ever faced." Kranz, the consummate steely-eyed missile man, turns, looks at him, and says, "With all due respect, sir, I think this is gonna be our finest hour."

So what does this have to do with Paul?

Well, I was thinking about his leadership over the past five years and his many significant accomplishments: He has overseen the largest weapon development programs in three decades; he has sharpened the Labs' strategic focus through the development of the Laboratories Framework, with its clear articulation of Sandia's mission areas; he has made it a personal priority to ensure that Sandia fosters an inclusive environment. These highlights just skim the surface of a profoundly consequential term as Labs director during "interesting times." To me, it's telling, and almost certainly no coincidence given Paul's priorities and his leadership acumen, that over the past five years, Sandia has grown to be the nation's largest Federally Funded Research and Development Center – the largest by a very wide margin.

But I will always consider Paul's finest hour to be his leadership during one of the most difficult periods in the 20 years I've been at the Labs. Here's the scene: It was the fall of 2013. The budget battles in Washington were more difficult than usual. Congress had reached an impasse over whether to increase the nation's debt ceiling and had not passed an FY2014 budget or a continuing resolution. In that environment, it appeared very likely that Sandia, along with federally funded facilities across the nation, might have to shutter its windows, lock its doors, and furlough its employees.

The *Lab News* headline for Oct. 18, 2013, was: "Sandia prepares for federally directed shutdown," with a subheadline reading: "Paul Hommert briefs Labs staff at all-hands on plan for orderly transition to 'warm standby' status."

I don't have the space here to re-tell the entire story. I hope it suffices to say that many of us were convinced we'd be going home for some unspecified length of time. But we were also convinced, thanks to Paul's communications efforts, that he and his leadership team were doing everything they could to minimize the impact on employees while ensuring that essential functions, in particular those related to the most urgent national security concerns, were kept online. We were convinced, that is, that under Paul's principle-based leadership our management had our backs.

Let me quote from that *Lab News* article:

"What I don't want," Paul said, "is for the Labs to send some people home while others continue to work, depending on the specific amount of carryover funds in their particular projects. We're trying to keep the enterprise as whole as possible for as long as possible; we're all in this together."

That last phrase – "We're all in this together" – is the perfect expression of Paul's leadership philosophy: he lives it, breathes it, embodies it, practices it.

Ultimately, as many will remember, the shutdown didn't occur. The issues in Washington were resolved (sort of) and we employees were never furloughed. But we were ready; thanks to Paul's insistence that everybody be kept in the loop, we knew what the plan was and knew where we fit into that plan. We all drew a lot of confidence in knowing that Paul's steady hand was at the helm navigating us through those treacherous waters. We knew that come what may, we couldn't ask for a better captain. That is why, if anyone asks, I'll always say: "With all due respect, sir, that was Paul's finest hour."

See you next time.

– Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

Action required Important life insurance information for employees and retirees

Sandia Corporation is conducting a full beneficiary designation update of Sandia employees and retirees who do not have a beneficiary designation on file with Prudential Life Insurance Company of America.

Prudential will be the sole beneficiary record keeper for your Sandia-paid life insurance policy(ies).

On June 1, 2015, Sandia employees and retirees who do not have a beneficiary designation for their life insurance on file with Prudential will be sent a notification. Those who have already designated their beneficiary(ies) directly with Prudential will not receive the communication.

The communication will give instructions to update beneficiary designations either online via a secure web-site or through a paper designation form.

Please note that this is a required designation update and that any other Sandia beneficiary designation on record will be null and void.

The Prudential designation update will override any designation on file with Sandia. The designations must be completed by July 15, 2015. After this date, if no designation is on file with Prudential, benefits will be paid according to relationship: 1) spouse 2) child(ren), in equal shares 3) parent(s), in equal shares 4) sibling(s), in equal shares 5) estate.

It is very important to periodically review and update beneficiary information so that benefits can be processed for the designated surviving heir(s). Contact HBE Customer Service at 505-844-HBES (4237), option 2 with questions.

Recent Patents

Note: Patents listed here include the names of active and retired Sandians only; former Sandians and non-Sandia inventors are not included. Following the listing for each patent is a patent number, which is searchable at the US Patent and Trademark Office website (www.uspto.gov).

C. Jeffrey Brinker (1000): Aerosol Fabrication Methods for Monodisperse Nanoparticles. Patent No. 8,864,045.

Jonathan J. Wierer, Jr. (1123), and Andrew A. Allerman (1126): Impurity-Induced Disorder in III-Nitride Materials and Devices. Patent No. 8,895,335.

George T. Wang (1126): Method of Fabricating Vertically Aligned Group III-V Nanowires. Patent No. 8,895,337.

Dennis L. Youchison (1353): Methods for Making a Porous Nuclear Fuel Element. Patent No. 8,920,871.

Enrico C. Quintana (1522), Kyle R. Thompson (1522), David G. Moore (1522), and Jack D. Heister (1522): Multi-Step Contrast Sensitivity Gauge. Patent No. 8,858,076.

Mark S. Derzon (1719), Paul C. Galambos (1719), and Ronald F. Renzi (8625): Ion Chamber Based Neutron Detectors. Patent No. 8,912,502.

Murat Okandan (1719): Structured Wafer for Device Processing. Patent No. 8,895,364



Sandia National Laboratories

<http://www.sandia.gov/LabNews>

Albuquerque, New Mexico 87185-1468

Livermore, California 94550-0969

Tonopah, Nevada • Nevada National Security Site

Amarillo, Texas • Carlsbad, New Mexico • Washington, D.C.

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corp., for the US Department of Energy's National Nuclear Security Administration.

Bill Murphy, Editor 505/845-0845

Randy Montoya, Photographer 505/844-5605

Patti Koning, California site contact 925/294-4911

Michael Lanigan, Production 505/844-2297

Contributors: Michelle Fleming (Ads, Milepost photos, 844-4902), Neal Singer (845-7078), Patti Koning (925-294-4911), Stephanie Holinka (284-9227), Darrick Hurst (844-8009), Heather Clark (844-3511), Sue Holmes (844-6362), Nancy Salem (844-2739), Tim Deshler (844-2502), Valerie Larkin (284-7879), Lindsey Kibler (844-7988), Rebecca Brock (844-7772), Valerie Smith, manager (844-6167)

Lab News fax 505/844-0645

Classified ads 505/844-4902

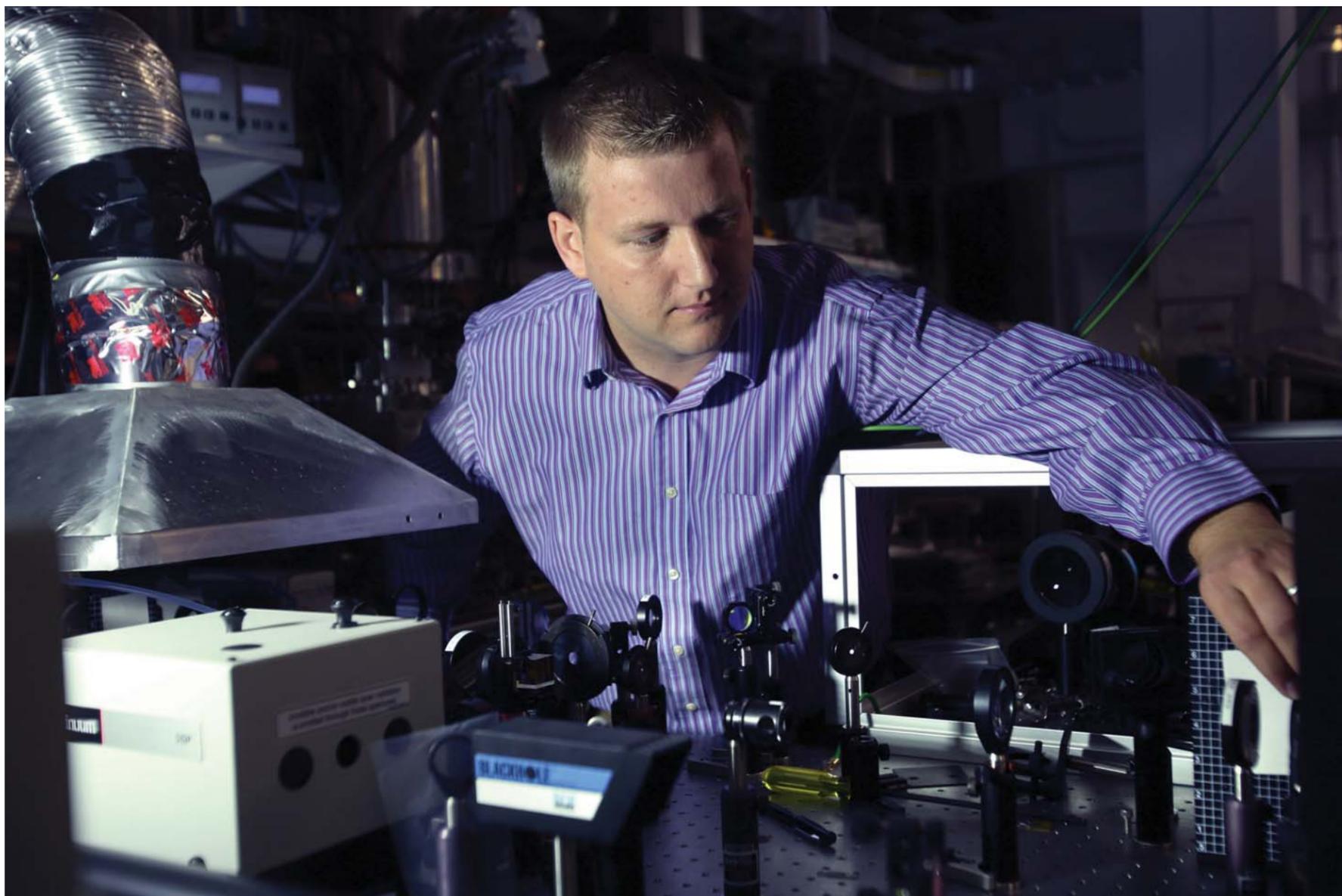
Published on alternate Fridays by Internal & Digital Communications Dept. 3651, MS 1468




Retiree deaths

| | |
|-------------------------|---------|
| Thomas Moody (age 95) | Feb. 26 |
| Edward Ames (92) | Feb. 26 |
| Zern Phillips (87) | Feb. 28 |
| Charles Grassham (87) | Mar. 1 |
| Mary Hampton (84) | Mar. 3 |
| Richard Johnson (86) | Mar. 9 |
| Albert Wiemken (86) | Mar. 9 |
| Clarence Skillern (90) | Mar. 10 |
| Virginia Dewitt (96) | Mar. 18 |
| John Rogers (87) | Mar. 18 |
| John Tenbrink (93) | Mar. 20 |
| Andrew Sayers (79) | Mar. 23 |
| Robert Dean Wehrle (91) | Mar. 24 |
| Chester Claghorn (81) | Mar. 26 |
| Michael Nicholas (68) | Mar. 28 |
| Ronald Cheek (75) | Mar. 31 |
| Louis Sanchez (75) | Apr. 2 |
| Walter Wyant (84) | Apr. 8 |
| William Jemison (93) | Apr. 10 |
| Charles Jenkins (77) | Apr. 11 |
| Norman Rosenberg (94) | Apr. 12 |
| Angie Rivera (87) | Apr. 16 |
| Robert Gaedert (83) | Apr. 18 |
| Alan Netz (83) | Apr. 19 |
| Edward Chavez (58) | Apr. 23 |

Christopher Kliewer wins \$2.5 million DOE Early Career Research Program award



SANDIA OPTICAL DIAGNOSTICS RESEARCHER Christopher Kliewer has won a DOE Early Career Research award that will fund the development of new optical diagnostic tools to study interfacial combustion interactions, which are major sources of pollution and vehicle inefficiency. (Photo by Dino Vournas)

Sandia California News

"I'm interested in interfacial combustion phenomena, like when a flame interacts with a wall. These heterogeneous processes dominate some of the most stubborn and technologically critical problems in combustion, yet they are not well understood."

By Patti Koning

Sandia researcher Christopher Kliewer (8353) has won a \$2.5 million, five-year Early Career Research Program award from DOE's Office of Science for his fundamental science proposal to develop new optical diagnostic tools to study interfacial combustion interactions, which are major sources of pollution and vehicle inefficiency.

Christopher's winning submission describes an approach to develop and use optical diagnostic tools to study the complex surface chemistry involved when gas-phase combustion interacts with solid or liquid interfaces. His proposal is titled "Interactions between Surface Chemistry and Gas-Phase Combustion: New Optical Tools for Probing Flame-Wall Interactions and the Heterogeneous Chemistry of Soot Growth and Oxidation in Flames."

"I'm interested in interfacial combustion phenomena, like when a flame interacts with a wall. These het-

erogeneous processes dominate some of the most stubborn and technologically critical problems in combustion, yet they are not well understood," says Christopher. "This is due in part to the lack of experimental approaches capable of probing locations very close to an interface, especially in the hostile environment of combustion."

In engine and power generator combustors, flames interact with metal walls during the combustion process. These interactions are a major source for pollutant emissions, such as unburned hydrocarbon and particulate emissions, and cause aging and failure in engines and generators. Christopher's project will develop a new nonlinear optical surface scattering technique to capture the dynamic chemistry of the flame-wall interactions.

This tool will be further developed to correct a deficit in existing experimental techniques for studying soot particles collected from flames. Nearly all these techniques require ex-situ analysis — meaning a sample must be removed from the flame to be studied. The act of removing the soot changes both the sample and the surrounding combustion, limiting the accuracy of results.

Ultimately, new insights into the chemical mechanisms of flame-wall interactions and soot growth and oxidation will inform combustion chemistry models that increase the fidelity of predictive numerical simulations of combustion devices, chemistry, and processes. Better simulations can help designers optimize engines and other devices to reduce pollution formation and

increase efficiency.

The project builds on and uses other recent advances in Christopher's lab, such as two-dimensional gas-phase coherent anti-Stokes Raman spectroscopy (2D-CARS). The technique, developed by Christopher and Sandia researcher Alexis Bohlin (8353), increased the capability of this optical diagnostic tool from capturing a CARS spectrum at a single point in space to a planar array of thousands of points within a single laser pulse.

"We developed that technique for gas-phase combustion," he says. "Now we're applying that technique to better measure and define the chemistry occurring at the interfaces."

Christopher joined Sandia in 2009. He has received two distinguished paper awards from the Combustion Institute for papers presented in optical diagnostics at the 2010 and 2014 International Symposium on Combustion. His paper on 2D-CARS was the most read paper in *Journal of Chemical Physics* for June 2013. He has a doctorate in physical chemistry from the University of California, Berkeley, and a bachelor's degree in chemistry from George Fox University in Newberg, Oregon.

Christopher is one of 44 winners from DOE labs and US universities chosen by peer review. The Early Career Research Program, now in its sixth year, is designed to bolster the nation's scientific workforce by providing support to exceptional researchers during the crucial early career years, when many scientists do their most formative work.

Davis gun tests aid B61-12 LEP

Story by Sue Major Holmes • Photos by Randy Montoya

Three years of designing, planning, and preparing came down to a split second, a loud boom, and an enormous splash in a successful impact test of hardware in the nose assembly of a mock B61-12 bomb.

The Sandia test also captured data that will allow analysts to validate computer modeling for the bomb, part of Sandia's decade-long effort in the B61-12 Life Extension Program (LEP). The B61-12 LEP is an \$8.1 billion NNSA program coordinated across the nation's nuclear security enterprise. Sandia is working with NNSA, the program lead; and five NNSA partner sites, industry partners, and the US Air Force, the B61-12 customer.

The Jan. 28 test, the first of three with Sandia's Davis gun, shot the assembly and its diagnostics into an 8-foot-deep steel-reinforced concrete water tank with a soil-filled bunker underneath to capture the hardware. The packed-dirt bunker makes it easier for engineers to recover data recorders and reusable parts and ensures that a test piece isn't damaged.

The tests, designed to validate a systems requirement for the B61-12, represented a worst-case scenario: a slow velocity into a soft target, in this case, 10,500 gallons of water. Shots were set for a prescribed velocity and angle to validate the impact sensor response for ground fuzing and to help understand the design margin, says Tyler Keil (2153), lead engineer for the B61-12 Davis gun test series.

Tyler and more than a dozen colleagues who worked on the test watched the first shot from a hill a half-mile from the mobile Davis gun, stationed at New Mexico Tech's Energetic Materials Research & Testing Center (EMRTC) in the hills west of the Socorro campus.

'Awesome' test highlighted years of work

"It was awesome," Tyler said after the shot. Tyler, who worked toward the test for more than three years, brought members of the team to EMRTC so they could watch a highlight of their work: shooting a bomb out of the cannon-like gun. Waning sunlight meant waiting until the next day to recover test data, and Tyler joked he'd "determine how happy I really am" after seeing the data from the recorder custom-designed and built by Ryan Layton (8133) and a separate recorder from Dept. 2627.

The Davis gun series marked the end of testing for the nose design, and by the end of the week, Tyler knew the test captured what the team needed. "Our team will assess these data, make note of any findings we see where improvements are needed to meet requirements, brainstorm ideas to address the findings, and incorporate them into the next design," Tyler says. "We'll then repeat the tests on the new design to verify that the changes were successful."

Manager Doug Dederman, whose Terminal Ballistics Technology Dept. 5431 conducted the test, explained how the gun works: Imagine the barrel as a straw, open at both ends, with an explosive charge sandwiched between the test nose assembly and a 2,000-pound steel slug, called the reaction mass. The test component and reaction mass are positioned to simultaneously blow out opposite ends of the barrel, the projectile slamming into the water of the adjacent pool and underlying bunker, and the reaction mass arcing to land behind a small hill. Using a reaction mass eliminates the recoil load in the gun chassis during firing and enables the gun to be towed on a trailer to different target sites. The gun's operation is under the control of James Dykes (5431) in partnership with EMRTC.

Crews from Sandia and EMRTC spent most of two days in final test preparations. On test day, the nose assembly, mounted on an aluminum tube to replicate the B61-12 body, sat in a stand about 200 yards from the pool. There it waited until time to load it into the 40-foot-long, 16-inch diameter barrel of the white Davis gun, stark against the backdrop of blue sky and a red jagged volcanic hill.

It took more than 20 minutes to move the projectile with the attached nose assembly from the assembly pad to the gun. The crew removed the assembly stand brackets, then suspended the projectile from the tines of a forklift equipped with a long hydraulic boom. They steadied the test projectile with tag lines as the forklift driver maneuvered up a dirt ramp to the Davis gun. There, it was bracketed into another stand to hold and roll it under the barrel where it was attached to a threaded rod and drawn up into the vertical barrel. The gun's dual-sheave hoisting system minimized rotation as the projectile was lifted into test position in the barrel.

High-speed cameras captured test footage in water pool

High-speed cameras at three levels in window ports in a small hut on one side of the pool and flash bulbs in a hut on the other side were synchronized with the gun's explosive charge to catch the action underwater.

As the arming and firing crew finished final preparations, everyone else evacuated to the viewing area for safety. The gun — which can be set at any angle — was tilted to firing position, the end with the nose piece pointed toward the pool. The crew at the gun finished local arming preparations and drove to the remote gun firing trailer at the viewing area. A roll call assured that everyone was accounted for and away from the test site. The gunner announced "Charged," counted down "five, four, three, two, one," and fired the gun just before 4 p.m.

Water splashed into the air as the nose assembly hit the pool at the lower end of the gun and a cloud of smoke drifted from the raised end as the reaction mass flew behind a hill well away from the action and the observers. "The reaction mass landed just where we expected it to, a first indication that we are close to the velocity we wanted," Tyler says.

Once the firing crew gave the all-clear, onlookers returned to the site and climbed onto the steel platform around the pool. Water had splashed a large radius of the dirt clearing around the pool, and the rest drained into a ramp leading down to the bunker. A large plastic tube dropped into the ramp with an attached fireman's hose siphoned the remaining water toward a nearby arroyo while a member of the crew shoveled mud out of the bunker to locate the test piece for the next day's final excavation.

About an hour after the firing, a small convoy of vans and pickups drove back across a winding dirt road through the hills to EMRTC headquarters. Some of the crew would be back the next day to recover the data recorders so engineering analysts could begin their work.

Analysts will spend the next year using the data to calibrate their models, then explore impact scenarios that weren't tested to evaluate the impact sensor's performance.

"The B61-12 LEP has performed several impact tests of various target types and velocities over the last year to verify its ground fuzing performance," Tyler says. "The Davis gun test series specifically tests the B61-12 ground fuzing performance during a water impact. All of the impact testing contributes to how reliably the B61-12 will fuze upon a ground impact."



MAKING AN IMPACT — A test B61-12 nose assembly fired from Sandia's Davis gun splashes water from an 8-foot-deep pool as a 2,000-pound reaction mass sails into the air from the other end of the gun in a successful impact test at New Mexico Tech's Energetic Materials Research & Testing Center. The reaction mass eliminates the recoil load in the gun chassis during firing.



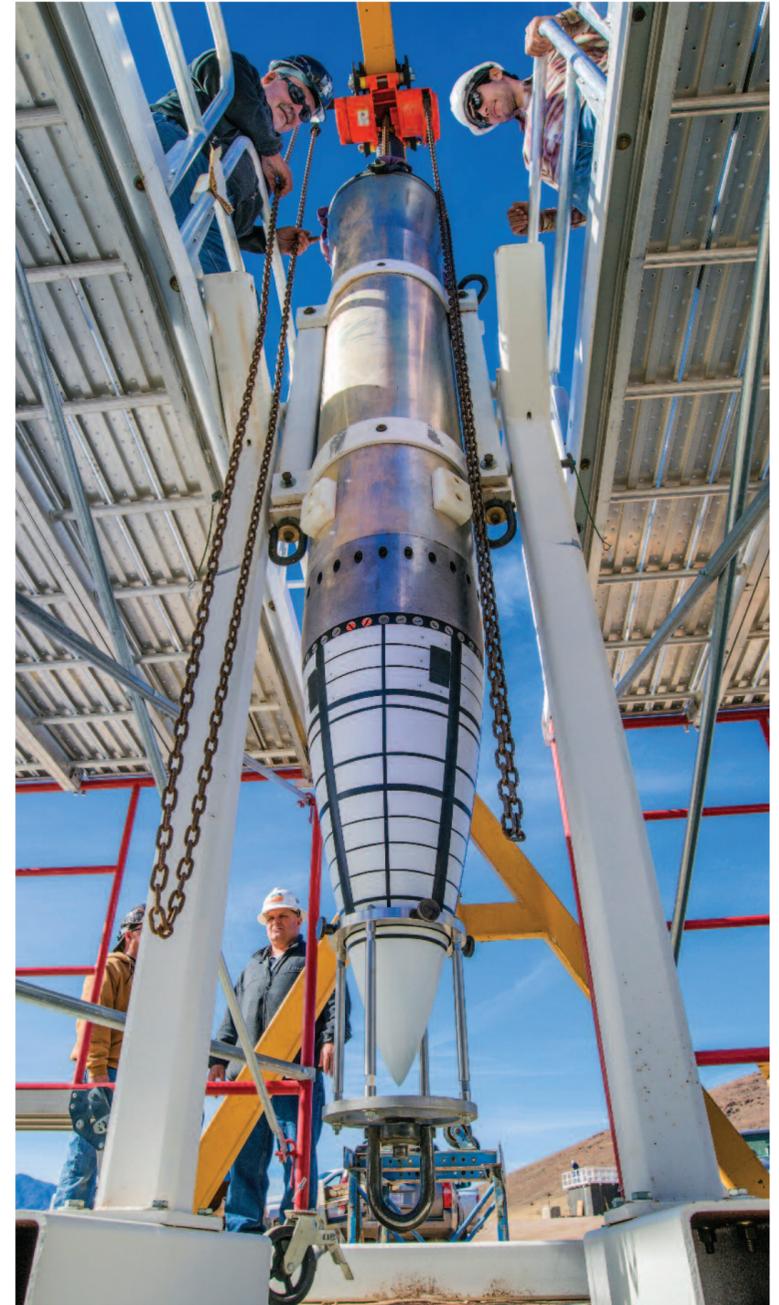
JAMES DYKES (5431), left, Sandia's subject matter expert for its Davis gun, and Anthony Gonzales of New Mexico Tech's Energetic Materials Research & Testing Center steady a nose assembly of a mock B61-12 as it is drawn up into the Davis gun for a test. The test captured data that will allow analysts to validate computer models of the bomb.



TEST POOL — Workers from Sandia and the Energetic Materials Research & Testing Center (EMRTC) at New Mexico Tech gather around an 8-foot-deep water tank as they discuss preparations for a test at EMRTC. Sandia's Davis gun shoots test articles into the pool in tests of a so-called soft target.



LEAD ENGINEER Tyler Keil (2153) does a diagnostics check with his laptop as final preparations begin for an impact test at New Mexico Tech in Socorro. Three years of design, planning and preparation culminated in a split-second test of hardware in the nose assembly of a mock B61-12 bomb.



NOSE ASSEMBLY — The nose assembly of a mock B61-12, mounted on an aluminum tube to replicate the body of the bomb, sits in a stand awaiting movement to Sandia's Davis gun, which fired the test assembly into a pool in one of a series of impact tests.



READYING THE TEST — A worker steadies a mock B61-12 as it begins its trip via forklift to the barrel of Sandia's Davis gun as part of experiments for the B61-12 Life Extension Program. The Davis gun is stationed at New Mexico Tech's Energetic Materials Research & Testing Center.

Government R&D and the shale boom

Note: Pete Domenici, who served in the US Senate from 1973-2009, remains active in the public policy arena as a senior fellow at the Bipartisan Policy Center. In this guest column for the Lab News he makes a case for targeted public investment in R&D coupled with leadership in the private sector. The views here are his own.

By Pete Domenici

When it comes to the oil and gas production boom in the United States, few people want to give credit to the essential role of government research and development (R&D). But the shale boom is a story of early government R&D paired with critical efforts in the private sector, particularly those of Mitchell Energy.

“We must also recognize that taking chances is a fundamental part of the R&D process — not every theory, experiment, or emerging technology will yield results in the way researchers hope. However, every now and then, these efforts strike on something truly extraordinary . . .”

The shale boom is important for a variety of reasons, not least of which are the economic and trade benefits it brings. The United States has spent — and continues to spend — a significant sum on crude oil imports. For just the years 2010-2014, this total amounted to over \$1.4 trillion¹ — a transfer of wealth to other nations that could have otherwise been used for our own growth and prosperity. However, thanks to dramatic technological breakthroughs, US crude oil production has increased in each of the previous six years. In fact, the increase in 2014 was greater than it has been in any year since recordkeeping began in 1900 — a period of more than a century.² This is in sharp contrast to a declining trend that spanned more than two decades from 1985 to 2008, during which production fell in every year except one.³

This reversal is a testament to the potential power and sweeping impact of directed public R&D combined with significant private sector action. But in addition to noting these dramatic successes, we must also recognize that taking chances is a fundamental part of the R&D process — not every theory, experiment, or emerging technology will yield results in the way researchers hope. However, every now and then, these efforts strike on something truly extraordinary, and in the case of domestic oil and natural gas production, new technologies and their applications revolutionized an industry that was in decline.

One striking example of the government’s critical role in setting the stage for the shale boom comes

from an examination of early experimental work on demonstration wells. In the late 1970s and early 1980s, the US Department of Energy (DOE) provided matching funds for industry demonstration wells, and in 1986, collaborated with industry to successfully implement the first horizontal Devonian shale well in the Appalachian Basin. Along with the Gas Research Institute, DOE worked with companies through the early 1990s to complete a number of additional wells, including Mitchell Energy’s first horizontal well in the Barnett Shale.⁴ The federal government also played a substantial role in the development of microseismic mapping technology, which allows well operators to create an image of a shale formation’s fractures — lowering drilling risks, increasing well productivity, and decreasing costs.

And although there is an ongoing need to reduce federal spending, we must also be careful not to throw away the significant expertise and capacity embodied in our country’s national laboratories and other research institutions. The work of the national laboratories has made significant contributions not only to the transformational energy technologies described above, but also in other ways. Take, for example, the work of Sandia National Laboratories on polycrystalline diamond compact (PDC) drill bits to penetrate hard rock, a technology originally developed for geothermal energy applications. The laboratory’s efforts, in combination with industry partnerships, generated a huge volume of applied industry R&D — providing the foundation for the wide use of PDC drill bits for unconventional oil and natural gas production in the 2000s.⁵

Overall, the reversal in oil and natural gas production has not only benefited a particular industry, it has reduced the US burden of significant energy imports, diversified world energy supplies, and added to energy security for both the United States and its allies. These great benefits illustrate the critical role of targeted public R&D coupled with leadership in the private sector; we must be willing to take chances on



IN A QUIET MOMENT during the rededication in 2011 of the then-relatively new Weapon Integration Facility building as the Pete V. Domenici National Security Innovation Center, former New Mexico Sen. Pete Domenici pauses in front of the building named in his honor. Domenici remains active in the public policy debate as a senior fellow at the Bipartisan Policy Center.

(Photo by Randy Montoya)

key technologies, because breakthroughs like these pay themselves back many times over.

It would have been nearly impossible to imagine these energy developments a decade ago, let alone two or three decades ago, but these great benefits are now a reality, and we must recognize the early and critical efforts that led us to where we are today. None of this would have been possible without the federal government.

Domenici served in the US Senate from 1973 to 2009 and is a senior fellow at the Bipartisan Policy Center. Stuart Iler, Policy Analyst at the Bipartisan Policy Center, assisted in writing this article.

1. This figure excludes U.S. crude oil exports. See: U.S. Census Bureau, “U.S. Imports of Crude Oil.” Available at: <http://tinyurl.com/pxsf6jh>.

2. U.S. Energy Information Administration, “U.S. oil production growth in 2014 was largest in more than 100 years,” Today in Energy, March 30, 2015. Available at: <http://tinyurl.com/nrvtej7>.

3. Ibid.

4. Jason Burwen and Jane Flegel, “Case Studies on the Government’s Role in Energy Technology Innovation: Unconventional Gas Exploration & Production,” American Energy Innovation Council, March 2013. Available at: <http://tinyurl.com/nnsb7lt>.

5. Ibid.

Cancer

(Continued from page 1)

The removed nutrient is called asparagine, which cancer cells can’t produce on their own. But there’s more to the story.

It’s well-known that chemical attempts to kill cancers often sicken the patient. In the case of the cancer drug L-asparaginase type 2 (L-ASN2), whose primary effect is depletion of asparagine, side effects are generally attributed to the corresponding depletion of a chemically similar molecule called glutamine. All human cells need asparagine and glutamine to survive because each is essential to key biological processes. While most normal cells can synthesize their own asparagine, certain cancer cells cannot. So the ideal nutrient-deprivation strategy for cancers requires a difficult balancing act: remove asparagine from the blood to cripple the cancer, but leave glutamine intact so that the patient can tolerate the chemotherapy.

The researchers at Sandia and Maryland did molecular simulations to predict which mutations would produce that desirable result when introduced into the enzyme-drug L-ASN2, commonly used to treat certain types of leukemia. The scientists’ simulations succeeded in identifying a point in that enzyme’s chain of amino acids where a mutation theoretically would eliminate the drug’s unwanted attack on glutamine.

“Technically,” says Susan, “we simulated which parts of the two molecules came in contact with the enzyme. Then we realized that by substituting a single amino acid in the enzyme’s chain, we might avoid glut-

amine degradation by eliminating its contact with the enzyme.”

In computer simulations, the change looked promising because the most notable difference between asparagine and glutamine was the way they interacted with that specific amino acid.

“That made us feel that a chemical change at that single location was the key,” says Susan.

Tests underway on laboratory mice

It required a mutation to change the amino acid’s chemistry. The mutation was achieved by collaborators at MD Anderson, who used DNA substitutions to effect the change.

“Most researchers agree that removing glutamine from a patient’s blood was the problem in previous use of this enzyme-drug,” says Susan. “Our simulations showed how to avoid that.”

In test tube experiments, the new drug left glutamine untouched. Follow-up tests in petri dishes showed that the mutated enzyme killed a variety of cancers.

Tests underway on laboratory mice at MD Anderson should be completed by early 2016, and if they are successful, Susan says, human testing will follow.

“If we’re wrong, and keeping glutamine intact is not the answer to the cancer problem, we’ll continue investigating because we think we’re onto something,” she adds.

That’s because, she says, “we used high-resolution computational methods to redesign the cancer drug to act differently, in this case to act only on asparagine. Laboratory tests showed that the predictions worked and that the new drug kills a variety of leukemias. We hope our method can do that in a patient, and for

many more cancers. But if it doesn’t, then we’ll test the opposite strategy: redesign the enzyme to destroy glutamine and keep asparagine intact. Or fine-tune the enzyme to degrade the two molecules in a chosen ratio. We’re learning to control this enzyme.”

The joint work among Sandia, the University of Maryland, and MD Anderson began in 2009. Sandia managers Wahid Hermina (1200) and Steve Casalnuovo (1710) spearheaded the effort to bring Sandia and MDACC together for mutual benefit, using computational and biochemical expertise developed in national defense to help cure cancer.

Sandia, a national defense lab, is interested in curing cancers, and is also interested in developing expertise in building enzymes that can assist with biodefense.

Says Susan, “If we could redesign an enzyme to break down specific small molecules, and not get diverted by interactions with non-toxic molecules, then we could apply our technique to develop safer and more effective enzymes.”

Classical modeling was performed at the University of Maryland by Andriy Anishkin and Sergei Sukharev; at Sandia, post-doctoral researcher David Rogers (now at the University of South Florida) also carried out modeling studies.

Sandia post-doctoral researcher Juan Vanegas is performing quantum modeling to map out the chemical degradation process to better understand how to optimize the enzyme, says Susan. The experiments at MD Anderson were carried out by Wai Kin Chan, Phil Lorenzi, and colleagues in John Weinstein’s group. Earlier results have been published in the journal *Blood*.

This work is supported by Sandia’s Laboratory Directed Research and Development office.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

Due to the Memorial Day Holiday, the deadline to submit a Classified Ad for the May 29 Lab News will be noon, Thursday, May 21 not Friday, May 22. This change applies to the May 29 paper only.

MISCELLANEOUS

HOOD FIREWOOD RACKS, 2, 3-ft. diameter, \$5 ea.; portable propane grill, \$25; male bicycles, 2, 26-in., \$50/both. Horton, 883-7504.

DVD PLAYER, Sony, w/remote, \$20. Hennessey, 505-269-6243.

STORM/SECURITY DOOR, Larson, white, 36" x 81", w/deadbolt, retractable screen, sliding windows, all trim/hardware, \$100 OBO. Eklund, 505-480-3503.

RECLINING LOVESEAT, leather, off-white (almond), like new, originally \$1,000, asking \$300. Borrego, 379-3867.

QUEEN BED, brown rattan, w/frame, headboard, footboard, mattress, Ikea, no box spring needed, \$150. Babilonia, 505-554-4420.

PUSH REEL LAWNMOWER, Scotts, 20-in., w/grass catcher, \$60. Stikar, 505-884-4128.

MOVING SALE, living room set, 2 brown micro suede reclining couches, matching coffee & end tables, entertainment center, prices vary. Atchison, 505-235-5651.

STUDENT VIOLIN, used only 3 mos., excellent condition, \$400, negotiable. Walker, 259-0937.

DINING TABLE, wood, w/6 chairs, cloth seats & backs, \$60 OBO. Romero, 505-307-9389.

TWIN AIR MATTRESS, w/pump, never used; 36-pc. dinnerware, Iron Mountain; 12 crystal goblets; table lamps; email for photos & prices. Pitts, 505-293-5481, ladyeight@comcast.net.

DIGITAL CAMERA, Nikon D300, body only, 2 4GB CF storage, charger, MBD10 battery grip, extra battery, \$500. Gehrke, 263-7327.

'MILLION DOLLAR QUARTET' TICKETS, 2, June 5, orchestra/center/close in, \$80/both cash. Kelly, 299-3527.

GEORGE FORMAN NEXT GRILLERATION G5 GRILL, w/4 plates, \$60; Krups Slice/All food slicer, \$25. Bear, 881-7128.

'MILLION DOLLAR QUARTET' TICKETS, 2, June 6, 8 p.m., front row, center mezzanine, \$130/both. Verley, 410-9885.

SHARK STEAM MOP, used once, retails \$99, asking \$50; Wilson left-handed golf set, clubs, bag, balls, new, \$200. Cocain, 281-2282.

RIMS, 2 chrome 10-slot, 1 spare, fits '99 Explorer, free. Johnson, 505-296-7179.

KITCHEN CABINET/PANTRY, birch veneer, 36" x 80", no door handles, photos at <http://albuquerque.craigslist.org/mat/4999208363.html>. Roberts, 275-2941.

PUSH REEL LAWNMOWER, \$35; keyboard, Yamaha, w/stand, \$50; Bounty Hunter metal detector, \$45; more. Aragon, 888-3473.

STORAGE CABINETS, granite-topped, 73"L x 22"D x 32"H, \$100; tile-topped, 72"L x 22"D x 49"H, \$100; bedroom set, \$200. Spray, 505-385-2442.

DALLAS COWBOYS SINGLE GAME TICKETS, corner end zone, all home games available, call for more info. McCandles, 553-5281.

TSG HELMET, skateboard/longboard, brand new, \$65. Brewster, 238-4704, ask for Julie.

IRON, Steam Xpress, model S660, Black & Decker, w/instructions, hardly used, in original box, \$15. Wagner, 505-504-8783.

WATER SKI, EP, wide model, like new condition, \$45. Bentz, 857-0728.

TRANSPORTATION

'09 NISSAN ALTIMA, tinted windows, new tires, black, up-to-date maintenance, excellent gas mileage, 122K miles, great condition, \$9,500. Montoya, 505-620-0050, call or text.

'10 SUBARU LEGACY 2.5GT, blue, original owner, 107K miles, well taken care of, \$14,000. Waymire, 505-615-6030.

How to submit classified ads
DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:
 • EMAIL: Michelle Fleming (classads@sandia.gov)
 • FAX: 844-0645
 • MAIL: MS 1468 (Dept. 3651)
 • INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
2. Include organization and full name with the ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

'96 GMC SUBURBAN, 4WD, tow, seats 8, roof rack, leather, tint, Michelin tires, 187K miles, \$3,600. Mitchell, 505-977-8893.

'85 HONDA CRX Si, manual transmission, project car, needs work, 310K miles, \$850 OBO. Mora, 291-1250 or 573-1569.

'86 ISUZU TROOPER II, 2-dr., beige, service records, manual, 126K miles, excellent condition, NIDA \$4,150, asking \$3,500. Korbin, 505-299-9088.

RECREATION

'95 HARLEY-DAVIDSON ROAD KING, red, extras, 44K miles, \$6,250 OBO; '09 Harley-Davidson Dyna Low Rider, 8.5K original miles, \$9,650 OBO. Rodriguez, 377-7624.

'10 KZ-COYOTE HYBRID TRAVEL TRAILER, sleeps 8-10, slide out, excellent condition, photos available, \$14,000. Sedillo, 238-6079, call or text.

'13 VICTORY VISION TOUR, 5.9K miles, extended warranty, stage one performance add, perfect condition, \$15,800 OBO. Goodson, 505-407-1688.

'95 BMW R1100R, red upholstery, needs minor work, garage-kept, 36K miles, Los Lunas, \$2,000. London, 720-6979.

ELECTRIC BICYCLE, Trek Valencia, 20-in. BionX Pedal assist, purchased new '13, barely used, MSRP \$2,649, asking \$800 OBO. Castillo, 269-1705.

MOUNTAIN BIKE, Bianchi, 20-in., TR tube, upgraded components, 8-spd., \$175; bicycle work stand, Blackburn model WS-1, folds down, \$100. Hanks, 249-1931, call or text.

REAL ESTATE

3-BDR. HOME, 2 baths, 1,623-sq. ft., cul-de-sac, large lot, 2-car garage, Paradise Hills, \$172,500. Sedillo, 505-890-2698.

3-BDR. HOME, 3 baths, 1,200-sq. ft., vaulted ceilings, beautiful archways, newer roof, flooring, refrigerated air, \$129,500. Ramos, 972-951-0290.

4-BDR. SINGLE HOME, 2 baths, 1,615-sq. ft., excellent NW location, MLS#833473, \$198,500. Atencio, 249-8395.

3-BDR. HOME, 2 baths, 1,575-sq. ft., renovated, on 1/2-acre lot, Rio Rancho, \$165,000. Buck, 353-2667.

5-ACRES, Moriarty, building lot, mini-ranch, w/electricity, level, partially fenced, perfect distance from Highway 41, \$19,000 contact, \$16,000 cash. Mihalik, 281-1306.

2-BDR. CABIN, 2 baths, 2-story, 2 garages, Elephant Butte, w/deck & lake views, \$95,000. Clayton, 221-4918.

3-BDR. MOUNTAIN HOME, 2 baths, 2,235-sq. ft., awesome views, open space trials, Cedar Crest, 20 mins. to KAFB, MLS#834419, \$259,900. Evans, 221-9892.

3-BDR. MOBILE HOME, 2 baths, 2,016-sq. ft., carports, storage buildings, 1/2 acre, Navajo Dam, \$165,000. Gajewski, 505-632-1927.

3-BDR. HOME, 3-1/2 baths, 3-car garage, 5,170-sq. ft., tile roof, Four Hills, great views, built in '08, \$650,000. Layla, 505-321-3399.

WANTED

EXPERIENCED ROSE GARDENER, to propagate old rose by grafting or rooted cuttings. Hunter, 294-2877.

DOG SITTER, your home, responsible adult w/safe yard, 2 small terriers, owner travels occasionally, rate negotiable. Smith, 505-232-9838.

ROOMMATES, 2 rooms available, 15 min. drive to KAFB, students preferred, \$350/mo., split utilities. Wood, 505-270-8490.

GOOD HOME, vital to find loving home for indoor cat named Mia. Smith, 505-239-3291.

WORK WANTED

PET/BABY SITTING, this summer, UNM student. Twyeffort, 505-554-9287.

Recycle the Lab News

The Sandia Lab News is printed on 75 percent recycled content paper. Please recycle them in the yellow mixed paper bins.



Ken Holley honored by state Office of African American Affairs

Outstanding Service Award recognizes contributions to community, education

Long-time Sandia recruiter Ken Holley (3555) has been named a recipient of a 2015 Outstanding Service Award from the New Mexico Office of African American Affairs (NMOAAA). Ken is being honored for his contributions to educational advancement and economic empowerment in New Mexico's African American community.

According to the nomination package put together by Sharon Lawson (4249) and other colleagues and submitted on Ken's behalf to NMOAAA, "Kenneth Holley is an icon at Sandia National Laboratories in recruiting and in inspiring African American employees, as I can attest to personally after being hired at Sandia with the assistance of Mr. Holley more than 12 years ago."

Says Ken, "I am humbled by this award because it is from the community. There are so many other deserving people. I seldom think of the activities we are involved in outside of work. We just do what we do. It is good to know that some of it makes a difference."

Ken graduated with a B.A. degree from Winston Salem State University in North Carolina and earned his MBA from Oral Roberts University in Tulsa, Oklahoma. He worked for the US Department of Labor, Southwestern Bell Telephone, and Dow Chemical before joining Sandia in 1985, where he immediately began to make his mark. During his first year at the Labs, Ken designed and implemented Sandia's Historically Black Colleges and Universities Program, which has proved to be a very effective vehicle for attracting talented African American graduates to Sandia.

Ken was assigned to Sandia's Education Outreach Department to run the DOE Science and Technology Alliance to promote the development of STEM programs at selected minority colleges. He also has served as chair of the Labs' Black Lead-



KEN HOLLEY is a recipient of a 2015 Outstanding Service Award from the state Office of African American Affairs. (Photo by Randy Montoya)

ership and Outreach Committee, a group that focuses on attracting and retaining African American employees.

In his community outreach efforts, Ken has been closely involved with HMTECH — previously called the Hands on Minds on Technology program — for more than 20 years. HMTECH focuses on improving educational outcomes in New Mexico at the K-12 level and challenges youth to enrich their minds in the STEM disciplines. He is a member of the Alpha Phi Alpha fraternity, which, among its other missions, focuses on encouraging academic excellence. He also served on the Albuquerque Academy Board of Directors for six years, promoting the fiscal and academic programs at the school.

Ken is actively involved in his church as a Sunday school teacher and was a co-founder of its couples ministry, among other activities.

In the nomination package submitted to NMOAAA, one Sandia employee recruited by Ken more than 20 years ago wrote, "Ken, thanks for those late nights so many years ago; thanks for battling doubtful management and program leads and convincing them that African American students can thrive when given encouragement, a sense of purpose, an opportunity. . . . and thanks for continuing to be a dear friend to me and my family to this very day."

Ken credits his wife Belinda (3521) with being his inspiration. "She really deserves the accolades for making me the person I am," he says. Ken and other 2015 recipients of the Office of African American Affairs Outstanding Service Award will be honored in a luncheon ceremony on June 6 at the Hyatt Regency Hotel in Albuquerque.

— Bill Murphy

Memorial Day 2015

Sandian's son remembered as a soldier who loved life

By Lindsey Kibler

Zach Lovejoy, an Army infantryman, was killed five years ago when his convoy was attacked by enemy forces in Afghanistan. He was 20 years old. Zach was honored March 20 during the 2015 Maltz Challenge at Kirtland Air Force Base.



ZACH LOVEJOY PAUSES FOR A PHOTO after completing an airborne operation while assigned to the 82nd Airborne Division, Fort Bragg, N.C. Zach, the son of Mike Lovejoy (2735), was killed in Afghanistan, Feb. 2, 2010. (Photo courtesy of the Lovejoy family)

His parents, Mike (2735) and Terry Lovejoy, welcomed the opportunity to talk about the person and soldier their son was. "All he ever wanted to be was a soldier," Mike says. "He loved life, he loved the Army, and he loved working out, so it's fitting that he be honored in this way."

About 100 people from the military and law enforcement communities participated in the event, named after Air Force Master Sgt. Michael Maltz, a member of the elite pararescue team known as "PJs."

In 2007, Drug Enforcement Administration (DEA) Special Agents Keith Billiot, Todd Gregory, Chuck Noonan, and Carson Ulrich began the Maltz Challenge.

The four men worked with Derek Maltz, Michael's brother and the DEA's Special Operations Division special agent in charge. The event honors Maltz and five other PJs who were killed March 23, 2003, while on a mission to rescue Afghan children.

Each year event coordinators choose another service member to honor. Zach was selected after a family member submitted his name to the DEA Albuquerque District Office. The event is a CrossFit-style physical challenge — often called the Workout of the Day, or WOD, and consists of the following:

- 400-meter run
- 50 pull ups
- 100-meter fireman's carry or 200-meter farmer's walk with 50- or 25-pound dumbbells
- 50 dips
- 100 push-ups
- 50 knees to elbows
- 100 sit-ups
- 400-meter run

Mike and Terry spend much of their personal time organizing and attending events in Zach's honor. They sponsored the 2015 UNM Ultimate Ski and Snowboard Competition Jan. 17 in Red River.

"Zach, his sister, and I used to compete in it every year, so it has a special meaning to us to be able to sponsor it in his name," says Mike. "Any and everything we can do to make sure Zach is not forgotten — and all of our fallen service men and women are not forgotten — we will do it."

Mike says strong support from his management team makes attending events like the Maltz Challenge easier for him and Terry. "My manager [Shawn Dirk] has been absolutely, 100 percent supportive of everything that Terry and I have done in an effort to keep Zach's memory alive.

"We miss him every day and some days are harder than others, but we will always remember the life Zach lived and the love he had for his family and friends, for the Army, and for life. It's important that we remember all of our fallen heroes because they, and their families, sacrificed so much."

Mike, a member of Sandia's Military Support Committee, says he is happy with the opportunities Sandia provides to military members through initiatives like the Wounded Warrior hiring program.

The DEA Maltz Challenge is held every year in March throughout the United States. Each location has an opportunity to select its own honorees. This year, according to the event's website, a fallen service member from each branch was honored. The full list is avail-



MIKE (2735) AND TERRY LOVEJOY hold a shirt bearing the name of their son, Zach, during the 2015 DEA Maltz Challenge at Kirtland Air Force Base. Zach was 20 years old when he was killed while supporting Operation Enduring Freedom in Afghanistan. "We're very proud and very thankful that people still remember him and will keep his memory alive," says Terry. (Photo by Lindsey Kibler)

able at www.deamaltzchallenge.com online.

Employees interested in joining the Military Support Committee, formerly known as the Veterans Group or Sandia Armed Forces Employee Networking Group (SAFENet), should contact Clark Highstrete (1729) at (505) 284-8702 or chighst@sandia.gov.



ROGER NEWELL, Albuquerque's liaison for veterans, reads a proclamation at the Drug Enforcement Agency Maltz Challenge. The competition honored fallen pararescueman Master Sgt. Michael Maltz, as well as Albuquerque native Army Pfc. Zachary Lovejoy, an Army paratrooper killed in 2010 in Afghanistan. The event was March 20 at the Air Force Pararescue and Combat Rescue Gym.

(Photo by Todd Berenger, KAFB Public Affairs)



THE MALTZ CHALLENGE HONORS fallen pararescueman Master Sgt. Michael Maltz, as well as Albuquerque native Army Pfc. Zachary Lovejoy, an Army paratrooper killed in 2010 in Afghanistan. (Photo by Todd Berenger, KAFB Public Affairs)