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What it means to be systems integrator Page 5

Designing long-duration toxin sensors

Low-power sensors could last 10 years, providing surveillance, security

By **Mollie Rappe**

Imagine a smoke detector that instead of warning residents of smoke before a fire engulfs their home, is placed in mass-transit locations to alert travelers and first responders to hazardous chemicals in the air.

Researchers at Sandia have spent the last three years developing an ultra-low-power chemical sensor to detect sarin and other chemical warfare agents or gaseous industrial toxins, aiming to protect the public and warfighters.

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LOW-POWER DEVICES — Sandia microelectronics engineer Mieko Hirabayashi transfers microelectronic devices into storage containers. **Photo by Craig Fritz**

Catch me if you can? Check.

Sandia supports milestone hypersonic missile defense test

By **Troy Rummler**

Sandia is helping defend deployed troops and the nation against hypersonic threats.

During a March 24 test, the Missile Defense Agency, in cooperation with the Navy, launched a Sandia-developed Hypersonic Target Vehicle from a C-17 aircraft toward the USS Pinckney, an Arleigh Burke-class Aegis destroyer tasked with performing a simulated intercept.

Hypersonic weapons are hard to catch. They're fast, cruising at speeds starting at a mile per second and maneuverable, making their trajectories hard to predict.

But the destroyer was faster. Using integrated data from space capabilities passed through fire control and then provided to the ship, it successfully detected, tracked and executed a simulated engagement of the Sandia target. The test provided powerful data and validation for the Missile Defense Agency to use in future live-intercept testing.

Flight Test Other-40, or FTX-40, took place off the coast of the Pacific

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CAUGHT — A Medium Range Ballistic Missile with a Hypersonic Target Vehicle is launched from a C-17 aircraft off the coast of the Pacific Missile Range Facility, Hawaii, during Flight Test Other-40. **Photo courtesy of the Missile Defense Agency**

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EDITOR'S NOTE: Please send your comments and suggestions for stories or for improving the paper. If you have a column (500-800 words) or an idea to submit, contact the Lab News editor at labnews@sandia.gov.

Lights on at LIHE

A new era for Light Initiated High Explosives and weapons testing

By **Krystal Romero-Martinez**

THE CUT — Sandia Associate Labs Directors Jeff Heath, far left, and Steve Girrens, far right, gather with technologists and engineers for the Light Initiated High Explosives ribbon-cutting on March 11. **Photo by Bret Latter**

In response to the nation's evolving nuclear deterrence needs, Sandia upgraded and expanded the 60-year-old Light Initiated High Explosives facility. The Labs and NNSA unveiled the improved facility during a ribbon-cutting ceremony on March 11.

From the 1970s until the unofficial end of the Cold War in 1992, the facility was used for impulse testing the nuclear weapons stockpile. Although it closed near the end of the Cold War, Sandia predicted a future need for Light Initiated High Explosives testing and funded the team for six months to document processes and store critical equipment. The facility was dark from 1992 to 2001, used mainly for storage and to operate the testing-related environmental permit.

After a significant renovation of the facility began in 2001, the original Light Initiated High Explosives team returned to mentor and train the next generation of team members, then recommissioned the facility in 2002.

Sandia stored critical equipment, documented test processes, maintained the necessary environmental permits and made available the original subject matter experts to ensure a viable restart of this critical capability required to qualify the W76-1 warhead.

Since then, the facility has been at the forefront of qualifying reentry systems for the nuclear security enterprise. An emerging need to conduct impulse testing on live internal explosives informed a development proposal in 2010, a conceptual design study in 2015 and a defined requirement for the W87-1 warhead in 2019.

Construction and operational resilience

The construction contract for the upgraded facility, known as the Light Initiated High Explosives Annex, was awarded in February 2023, with the final temporary certificate of occupancy received in February 2025. Remarkably, this project was completed alongside ongoing explosive tests, including a critical qualification test for the W87-1 warhead, demonstrating the facility's operational resilience.

Because of the smooth collaboration among the LIHE team, Facilities, ES&H, Security and Summit Construction, the groups were able to conduct two years of scheduled explosive impulse tests while simultaneously managing a major construction project. In all, nine major tests were executed as the construction project was being completed.

The Light Initiated High Explosives Facility is the only test site that can simulate system-level, radiation-induced shock loading from a hostile nuclear encounter beyond the Earth's atmosphere. This mechanical shock uses a specialized primary explosive that is simultaneously detonated using an intensive flash of light from a 40-kilvolt, 150-kiloampere capacitor bank. The recent facility expansion increases the facility's explosive testing capability from the equivalent force of 1 to 50 pounds of TNT, providing vital structural response data on live internal high explosive in this hostile environment.

A commitment to safety and future capabilities

From construction and environmental, safety and health perspectives, the annex project involved complex modifications to a facility with a 60-year history. The project resolved legacy issues and ensured compliance with current codes and standards while continuing operations throughout construction. Effective coordination between testing and construction activities was essential, particularly given the hazardous nature of operations. The design also had to accommodate regulatory compliance, with significant contributions from various safety and security teams.

"LIHE is another step forward in advancing Sandia's mission by delivering the unique capabilities our nation relies on. Attending the facility's ribbon cutting filled me with immense pride and optimism for Sandia's future," Associate Labs Director for Infrastructure Operations Jeff Heath said. "With its dramatic enhancement in capability, LIHE sets a new standard for the nuclear security enterprise by offering an unparalleled simulation environment for reentry systems. I am truly humbled to be part of the dedicated team that brought this visionary capability to life."

BLACK LIGHT EXPOSURE — During an impulse test at the Light Initiated High Explosives facility, a test unit is sprayed with a sensitive explosive and exposed to ultraviolet lights to enhance energy absorption. **Photo by Craig Fritz**

The project's successful completion highlights a strong partnership between Sandia and NNSA. The project presented safety considerations, requiring design solutions beyond standard codes. The NNSA Sandia Field Office played a critical role in approving the alternate design and technical security aspects necessary for the facility. Funding for construction and readiness efforts was secured through specific program allocations, highlighting the collaboration that made this project possible.

Steve Girrens, associate Labs director for Nuclear Deterrence Components and Production, spoke at the ribbon-cutting ceremony about his passion for the project and his excitement about the future of the facility.

"The successful completion of the LIHE Annex project achieved a very significant milestone for ensuring the environmental qualification of our weapon systems today and into the future," he said.

Surveillance

CONTINUED FROM PAGE 1

Sarin is an extremely toxic nerve agent that can cause death within minutes. The production and stockpiling of sarin, along with other nerve agents and mustard gas, are outlawed. However, sarin has been used in terrorist attacks.

"When we're thinking about ultra-low-power electronics, we want to install a sensor and leave it in the field for a long time," said Mieko Hirabayashi, a Sandia microelectronics engineer and project lead. "We don't want to worry about replacing the batteries often."

Anyone who has changed a smoke detector battery in the middle of the night can appreciate the value of sensors that can operate for a decade without battery replacement.

Spongey sensor for sarin

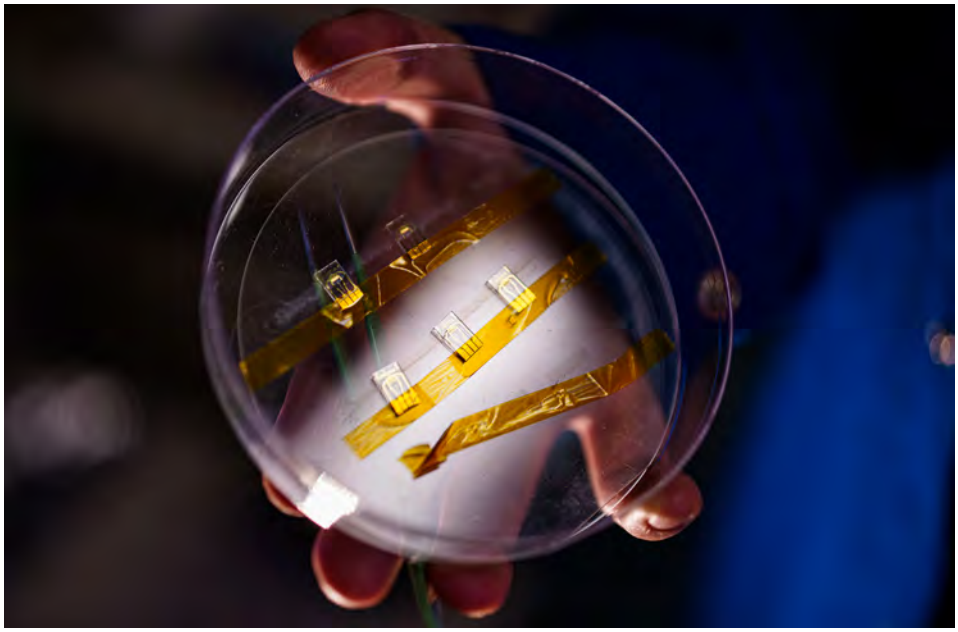
The sensing component consists of a porous, sponge-like material designed to chemically trap sarin and its chemical cousins.

This porous material, called a sol-gel, resembles spray insulation foam. The precursor chemicals are sprayed from a specialized nozzle onto a structure resembling two metal combs with interleaved teeth called an interdigitated electrode, said Philip Miller, a Sandia biomedical engineer on the project. The coated electrode is heated, causing the carrier liquid to evaporate and creating an open "popped bubble" structure.

"The porosity of the material creates more spots for the chemical of interest to land on," Philip said. "The more molecules the sensor can measure, the faster the alert it can provide. If the sensor is worn on someone's lapel, it can provide a 'get out of Dodge' alert. If the sensor is in the field, it can provide a warning to stay away."

When a molecule of sarin binds to the sol-gel between the electrode's teeth, the material's electric properties change. This property, called capacitance, is detected by the rest of the sensor using minimal power, Philip said.

The team also explored using a different electrical measurement called impedance, which uses more power but is more selective. This would be valuable if the chemical of concern is similar to common airborne chemicals, Mieko said.



TINY SENSORS — Microelectronic devices consisting of two metal combs with interleaved teeth with a coating of a porous material designed by Sandia to trap and detect sarin, and related chemical warfare agents. **Photo by Craig Fritz**

The development of the sol-gel material was funded by Sandia's Laboratory Directed Research and Development program in an earlier project.

Converting chemical to electronic signals

The Sandia team collaborated with a professor and graduate student at the University of Virginia to design a readout integrated circuit that can detect changes in the sol-gel and convert them into useful signals while consuming minimal power, Mieko said.

This was important because a readout integrated circuit typically consumes the most power in a sensor system, said Jesse Moody, a Sandia sensor engineer who led the circuit design.

"Essentially, we needed to develop a device that can detect very minute changes in that capacitive sensing film and convert that into useful digital information in an extremely low-power manner," Jesse said. "That was the main electronics challenge of the project."

The circuit was designed using structures on the scale of 65 nanometers, 1,500 times smaller than a human hair and three times smaller than the smallest transistor available from Sandia's Microsystems Engineering, Science and Applications Complex's fabrication facilities. This size was chosen to allow the sensor system to operate faster while using less power, Mieko said.

The circuit can quickly check the status of 10 chemical sensing channels in a few thousandths of a second, Jesse said. The development of the ultra-low-power readout integrated circuit built on prior LDRD and DOD projects in low-power sensing, he added.

The circuit design was fabricated at Taiwan Semiconductor Manufacturing Co., one of the world's most advanced microchip fabrication facilities. Typically, it costs about $1 million to have a custom microchip fabricated at such a foundry; however, for this project, the Sandia team shared the initial cost with other companies as part of a multi-project wafer, Mieko said.

Usually, these multi-project wafers are diced, and each company receives only the square millimeter segments — about the size of a sharpened pencil tip — containing their design, Jesse said. However, these tiny pieces are challenging to handle and build on, even when inserted into a slightly larger package with connections called a silicon interposer, Mieko said.

For this project, the researchers had the other companies' designs removed with a high-power laser and developed an innovative method to fill in the gaps with a polymer, allowing them to work with and build on a full silicon wafer, Mieko said.

DEDICATED ENGINEERS — Sandia biomedical engineer Philip Miller in his lab.

Photo by Craig Fritz

Testing the full sensor

After resolving issues with the polymer planarization, the team assembled the sensor system. They compared the sensor system constructed via the heterogeneous integration pathway — from the tiny chips in a silicon interposer — with a monolithic sensor where everything was built on the same wafer.

The final monolithic sensor system measured 1 by 1 inch, while the heterogeneous test system was 10 times larger, Mieko said. She added that had the team optimized the heterogeneous sensor system, they could have reduced its size to about twice that of the monolithic sensor.

The monolithic sensor system used 30.9 nanowatts of power per sensing channel and had an area of 43 microns per channel. It ultimately consumed slightly more power per channel than the heterogeneous system due to a power leakage issue that the team didn't have time to fully resolve, Mieko said. Once they optimize the monolithic system further, it should use less power than the heterogeneous system because direct connections require less power.

Since the proof-of-concept sensor system was successful, the team is exploring additional funding sources to continue developing ultra-low-power, long-lasting chemical sensors, Mieko said. The sensor system could be adapted with other chemically selective materials to detect multiple chemicals of concern in the same device, Philip said.

"The novelty of integrating the low-power microcontroller and the sol-gel sensor was a really cool project to work on," Philip said. "Doing system-level sensor work is hard and doing it in this innovative way is especially challenging. I think we have a nice path forward to realize a functional device with additional support."

The project was funded by Sandia's LDRD program.

Multi-project wafers made easy(er)

Multi-project wafers significantly reduce the initial cost of fabricating microchips at external foundries, but they can also introduce challenges. Typically, these wafers are diced, and each company receives only the square millimeter segments containing its design. Handling these tiny pieces during further processing can be difficult, said Mieko Hirabayashi, a Sandia electronics engineer and project lead. For this project, the team used wafers from which other companies' designs had been removed with a high-power laser.

"The biggest success we had was with the planarization of the multi-project wafer," Mieko said. "Initially, the project proposal called for a layer of oxide to planarize. But they didn't fully understand the height that needed to be planarized, and that amount of oxide would have cracked under stress. I spent a lot of time researching different polymers that could give us that layer that we needed for the planarization."

Mieko discovered that one polymer, SU8, effectively filled the gaps created by laser etching out the other companies' intellectual property in the commercially produced wafers.

"Thankfully, we got a new tool called the nanoform, which is a purely mechanical processing tool. A mechanical etch works much better for full planarization. It created a very planarized layer, similar to what we have with a regular wafer. That tool made a huge difference."

The nanoform mechanical processing tool is located in the lab of materials scientist Christian Arrington, and the process was refined by laboratory support technologist Chris St. John, Mieko said.

"There were a couple of tricks we had to implement to make sure we didn't introduce too much heat at once because you're working with pretty thick material at that point that could crack or become stressed. That was one of the key developments that allowed us to get it to function."

Sandia's unique role in nuclear deterrence

What it means to be the systems integrator

By **Kenny Vigil**

Sandia serves a unique role in the nuclear security enterprise: lead systems integrator for the nuclear weapons program. The systems integrator ensures that the many complex parts of the weapon and its delivery vehicle work together flawlessly, and that system performance is optimized across all the requirements. It's an important role.

"Sandia has the responsibility to establish clearly defined system interfaces so that subsystems will interact as expected and function as designed," said Laura McGill, deputy Labs director for Nuclear Deterrence and chief technology officer.

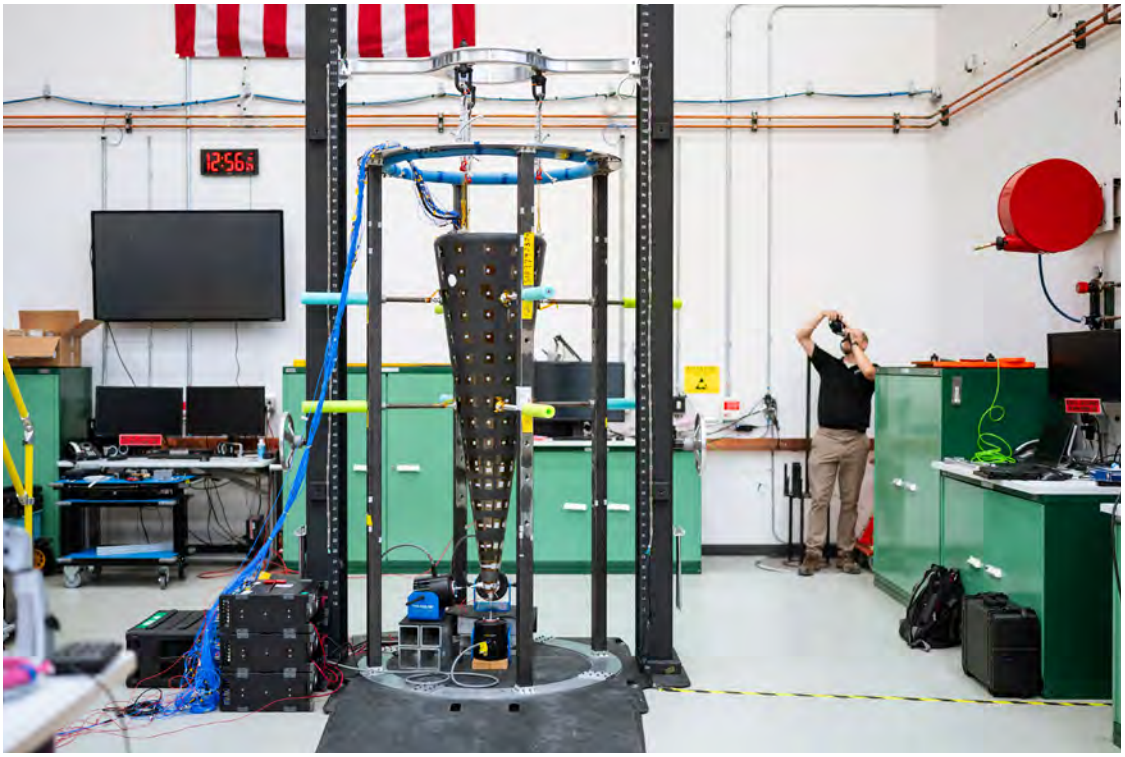
Sandia does not have design authority for the nuclear explosive packages that are controlled by Lawrence Livermore National Laboratory or Los Alamos National Laboratory but works closely with design agency partners to develop allocated requirements that are balanced to best meet the specified military characteristics.

"The role of lead systems integrator doesn't mean we make all the decisions. Our responsibility is to ensure that key decisions are anticipated and get made when needed, to keep the program on track. And if there is disagreement, we quickly elevate those to the senior

management teams for resolution to prevent program delays," Laura said.

The integrator is especially important in the current environment where many elements of the nuclear security enterprise are pushing against available capacity.

As Laura said, "We have to make the best use of our enterprise resources. We cannot demand excessively large quantities of development hardware from the Kansas City National Security Campus for development and integration when they are already delivering at maximum rate to meet production requirements."

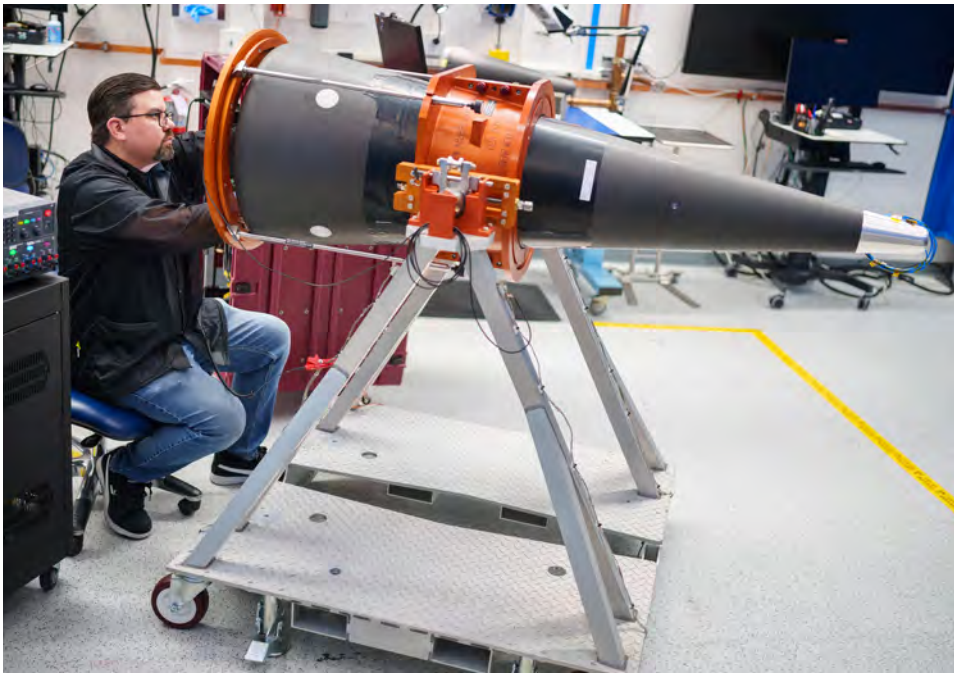


THE SANDIA SPECIAL — Sandia's role as lead systems integrator is unique in the nuclear security enterprise. A big focus of that role is ensuring critical decisions are made to keep the program on schedule. **Photo by Craig Fritz**

W87-1

As the systems integrator, Sandia facilitates discussions on schedules and activities, including required testing for weapon systems.

"Sandia provides an environment for positive interactions and conversations," said Scott Lindblom, a senior manager in nuclear deterrence.



SEAMLESS INTEGRATION — As systems integrator, Sandia plays a critical role in nuclear weapons, including the W87-1, which is in the development phase. The role spans the entire lifespan of the weapon and requires close collaboration with other labs, plants and sites. **Photo by Craig Fritz**

Scott said Sandia recently completed a system baseline design review knowledge gap analysis on the W87-1, which is replacing the W78. Following that process, two system-level tests were deferred until later in the program, while one was accelerated to provide quicker knowledge gap closure. Another test was canceled because it would not provide additional data to support baseline design readiness.

"The systems integrator role is about moving the program forward. We're checking ourselves to ensure we don't have excess work plans," Scott said. He echoed Laura's sentiment about the role Sandia plays as systems integrator: "Most of the time we're not the decision maker; we are there to make sure the decision is made."

More than design

Sandia's role as the lead systems integrator extends past the development and design phase to include the operational

sustainment phase.

Sandia is responsible for technical integration related to the weapon for the entire lifecycle of a system — until the weapon is retired from the stockpile and fully dismantled and dispositioned.

As systems integrator, Sandia works with the other eight labs, plants and sites, as well as NNSA offices, federal program managers, the DOD and the military services that will use the systems.

"As the weapon ages, we identify subtle effects on performance that must be addressed. As the systems integrator, we work with our partners to establish solutions that account for all system implications, including potential changes to procedures for the military operators," Laura said.

Why Sandia?

Sandia applies the principles of "always/never" across a weapon system, meaning when authorized for use, the weapons will always work as intended, and they will never work under any other circumstances. This obligation requires close collaboration between Sandia and defense contractors.

"We have the direct interface with the prime contractors that provide the delivery platforms," Laura said. "We develop a deep understanding of overall vehicle performance."

From a broader perspective, NNSA's digital engineering initiative aims to use common tools and establish a digital thread for the entire nuclear security enterprise, which will help streamline Sandia's systems integrator role. For example, a design change will more quickly make it to the production agency.

"The role of systems integrator only works when you have great partners," Laura said. "Our relationships with the other labs, plants and sites and NNSA are critical to our ability to deliver on our commitments to the nation."

Missile defense test

CONTINUED FROM PAGE 1

Missile Range Facility in Kauai, Hawaii. It represented a significant advance both toward countering the new and increasing challenge of hypersonic weapons and Sandia's ability to aid the nation in this endeavor.

"This is the first time we've flown a hypersonic advanced target for MDA and a big step forward for the nation," said Dennis Helmich, Sandia's director for integrated military systems.

As a Federally Funded Research and Development Center, Sandia has had a longstanding collaboration with the DOD in hypersonics.

Building on that work, Sandia designed and built a new variant glide body as a target for the Missile Defense Agency, specially engineered to mimic a wide variety of threats in a test environment. Sandia integrated the hypersonic payload with a provided rocket booster and assisted with the test.

Sandia has a rich history in engineering hypersonic vehicles that dates back more than 40 years and continues to support technology maturation, vehicle development and cost-effective flight testing.

In 2024, Sandia concluded a seven-year, $40 million internally funded Autonomy for Hypersonics research campaign to study and advance hypersonic technologies such as autonomous trajectory-planning algorithms while connecting universities that support the nation's hypersonic needs. The Labs identified post campaign funding of over $40 million from other agencies to continue the work.

Modular, deployable and secure

Transportation Safeguards and Surety Program prototypes new storage solution

By **Ellena Tapia**

Sandia's Transportation Safeguards and Surety Program design team has developed a modular vault inside a 20-foot shipping container to store and protect critical assets in austere environments.

The team accomplished this in response to a challenge by the NNSA Stockpile Responsiveness Program to provide a capability for temporarily deploying assets and technology that require secure storage to places where permanent storage is not available.

Typically, sensitive technology and assets are stored in permanent, high-security facilities, bunkers and vaults that can take decades and hundreds of millions of dollars to build. When the Exploratory Systems and Special Projects group asked to use a secure transporter for a demonstration of rapidly deployable high security storage, surplus transporters were not available without taking them off the road and interrupting work.

Stephen Neidigk, manager of the Access Delay department, suggested a new approach and challenged his team to design and build a functioning prototype within six months.

"The first vault prototype was a 1-to-14 scale model of a shipping container with a vault, ramp and weapons inside. This model, costing less than $500, was instrumental in gathering feedback from customers and potential end users and it facilitated design meetings," Stephen Neidigk said. "I brought the model to every design meeting during the six-month effort. Fifteen subsequent models are now on the desks of decision-makers at U.S. Combatant Commands, the Pentagon and U.S. Strategic Command."

The vision

To motivate the design team at the beginning of the project, Stephen created a mock Labs Director update, modeled after James Peery's monthly email but dated it six months in the future, and crafted a success story highlighting the accomplishments of the Mobile Vault project. He sent it to the team and Gary Laughlin, the center director at the time.

BUILD OUT — Two technologists weld the Mobile Vault frame to the exterior Conex container. Outside the container, an engineer performs a 3D scan of the Mobile Vault. **Photo by Craig Fritz**

In response, the Access Delay team turned the traditional engineering method upside down and adopted an approach to swiftly design, fabricate and demonstrate a high-security mobile storage vault.

"In the first two weeks of the project, we collaborated with the Advanced and Exploratory team to establish key requirements. Our focus was on defining high-level requirements to provide sufficient guidance for the design team without overly restricting their creativity," Stephen said. "For instance, rather than specifying a fixed delay time, we agreed on a requirement to maximize delay performance within the volume and weight constraints. These constraints were determined by the need to be C-130 transportable and weigh less than 30,000 pounds."

Prototypes for faster design

Once design requirements were defined, Stephen asked the team to submit design concepts within two weeks. The team submitted 10 ideas, selected a winner and got to work. Engineers began by developing a functional prototype, rather than a white paper or analysis. Despite working in an environment often constrained by red tape, the team was focused on reaching tangible outcomes in a short timeframe.

"Several years ago, I took a design thinking course as part of Sandia's Strategic Engagement Training, where the 'Build to Think' methodology that emphasizes creating low-fidelity tangible prototypes, quick iterative learning and user-centric focus, resonated with me. It aligned perfectly with my practice of moving quickly from whiteboard to prototyping," Stephen said.

To support rapid fabrication of the full-scale vault, the team followed this model-based manufacturing approach. A mechanical engineer on the team developed a solid model, and before the design was complete, the team started working with the fabricator to begin procuring long lead time materials such as the semi-custom vault door and plate stock materials.

Bring in more experts

Engineers from the team traveled to the vendor in the early stages of manufacturing and helped ensure the fabricator had what they needed to be successful and meet schedule. As the model was completed, a build specification document was provided to the manufacturer further defining build requirements that could not be communicated through the model.

In addition to vault structure, the electrical functionality of the prototype was

critical to gathering feedback from end users. An electrical engineer, who led the design of the access control system, battery backup, sensing unit and alarm systems, applied additive manufacturing, design reuse and development boards to achieve a functional prototype effort in half the time.

As hardware was completed and shipped to Sandia, the Transportation Safeguards and Surety Program tapped Sandia staff in other areas for fabrication expertise, including sheet metal forming, welding, machining and rapid prototyping skills. The team used large overhead cranes and the biggest forklift at Sandia to meet the demanding time constraints.

COMPACT — The mobile vault with the vestibule open. **Photo by Craig Fritz**

Innovation continues

The effort is continuing by building two more full-scale prototypes that expand on the "Build to Think" methodology. These builds were completed with support from the Sea Launched Cruise Missile - Nuclear program. The team has been accepted to participate in the prestigious Grey Flag 25 exercise, a joint DOD exercise to assess and improve the operational readiness of critical hardware, ensuring it can respond to real-world events. The team aims to transfer this capability to industry for larger scale production to support warfighters.

"Executing the Mobile Vault project has been the most rewarding and exciting project I have worked on in my career," Stephen said. "When we demonstrated the full functionally of the vault to the customer in six months to the day, I went back and checked my emails and almost couldn't believe that we did it. The drive and passion the team has had for this project is like something I've never seen."

SENSORS SET — An engineer adjusts sensors inside of the Mobile Vault's vestibule while another watches. **Photo by Craig Fritz**

Innovation is motivation

Sandia scientist named outstanding researcher by FLC

By **Kim Vallez Quintana**

"As a boy I remember my interest in science and learning new things, making new things. That has always been my motivation," Sandia scientist Hongyou Fan said.

Hongyou was recently named Outstanding Researcher by the Federal Laboratory Consortium for Technology Transfer, a group dedicated to accelerating federal technologies in the marketplace.

Called a "serial innovator" by his peers, Hongyou was recognized by the consortium for his leadership in translating scientific discoveries into market-ready technologies and his work in materials manufacturing, nanoelectronics and critical materials supply chains.

"I feel excited, honored and rewarded," Hongyou said. "It has been a longtime commitment to tech transfer in my 25-year career at Sandia."

Latest success: Disinfectant 2.0

One of the best examples of Hongyou's contribution to technology transfer is his pioneering work on Disinfectant 2.0, a product developed during the COVID-19 pandemic that kills viruses, bacteria and fungi for long periods.

OUTSTANDING RESEARCHER — Scientist Hongyou Fan has been named Outstanding Researcher by the Federal Laboratory Consortium for his innovation and work in technology transfer. **Photo by Jennifer Plante**

The disinfectant is based on Hongyou's work on highly efficient porphyrin nanoparticle photosensitizers, developed at Sandia as part of its national security mission. Light triggers a chemical reaction in porphyrins, releasing substances that kill disease cells while being safe for people. Tests have shown that once sprayed, Disinfectant 2.0 keeps working for months to years.

Hongyou led the team that expediated the technology transfer process, leading to the product's commercialization by Lunano LLC.

Impact beyond the Labs

Hongyou's groundbreaking contributions to technology transfer have earned him six Federal Laboratory Consortium awards, including three in the last five years. He has also led efforts resulting in eight R&D 100 Awards and secured 21 patents, with three more pending.

Recognized by his peers as not only a scientist and manager but also an educator, Hongyou mentors students through various local STEM programs, helping develop the next generation of scientists and engineers. He has shared his research through hundreds of publications and international presentations for professional organizations addressing key technical challenges in industry, academia and the national labs.

LEADING INNOVATION — Sandia scientist Hongyou Fan has led his team to invent an eco-friendly technology for extracting critical minerals from coal and coal ash. **Photo by Craig Fritz**

Hongyou currently serves as Sandia's department manager of Geochemistry, manager of the DOE Office of Basic Energy Sciences Geoscience Program and manager of the Sandia office of Fossil Energy and Carbon Management Critical Minerals Program. In this latest role, Hongyou has led his team to invent eco-friendly technology for extracting critical minerals from coal and coal ash, contributing to the establishment of a reliable, secure and sustainable domestic supply chain of critical minerals.

Hongyou says he looks forward to expanding that work and was excited to hear of the new administration's focus on critical mineral extraction research.

"It is a high national security priority, and I am leading that effort within Sandia. It's an area that I am so excited about. I will continue the journey to lead innovation," he said.

A long Sandia career

Hongyou has spent his entire career at Sandia, after being hired right out of grad school. He says it was the weather that brought him to New Mexico and the University of New Mexico.

"I applied to a lot of universities and since my hometown was very cold and snowy, I picked a warm and sunny area. I think it was a wise decision," he said.

Twenty-five years later, Hongyou is still innovating. He recognizes that his success would not have been possible without the support of Sandia and the many teams he has worked with.

"I am thankful that I have been able to contribute to a lot of projects and research programs under different science and engineering areas. I have enjoyed working with different people with different specialties and sharing ideas that make innovations. Innovation is motivation," he said.

Learn more

Learn more about Hongyou Fan and the other award winners on the 2025 Federal Laboratory Consortium website.

Threat multiplier

RESILIENCE AND NATIONAL SECURITY — Sherri Goodman, secretary general of the International Military Council on Climate and Security, spoke to an in-person and virtual audience of more than 1,700 staff members March 31 as part of Sandia's National Security and Climate Security Speaker Series.

She drew on her book, "Threat Multiplier: Climate, Military Leadership, and the Fight for Global Security," to illustrate the convergence of environment, climate and national security. Goodman related how threat multipliers like heat and drought compound with other security risks like water scarcity to increase the risks of instability and conflict.

For more than a decade, the National Security Speaker Series has invited distinguished industry, government and academic leaders to share with the Sandia workforce their perspectives on topics that touch the Labs' mission areas. The Climate Security Speaker Series, similarly, hosts external speakers to promote thought, discussion and partnerships that can further enhance Labs climate security efforts. Employees can find Goodman's talk on the Climate Security Speaker Series webpage.

Photo by Craig Fritz

Sandia postdocs compete in Rio Grande Research SLAM

By **Sophia Horowitz**

Postdoctoral researchers from Los Alamos National Laboratory, Sandia, National Renewable Energy Laboratory and the Air Force Research Laboratory took center stage at the third annual Rio Grande SLAM on Oct. 31. The competition challenged participants to distill their complex research into engaging three-minute presentations, making science accessible to all.

Postdoctoral researchers Michelle Bester, Alex Boehm and Daniel Vigil represented Sandia at the SLAM.

Michelle Bester: Decoding the Canopy

Michelle Bester took third place at the SLAM for her talk "Decoding the Canopy." She discussed the alarming increase in the frequency and intensity of wildfires over the past decade, with recent fires in New Mexico causing more than $1.2 billion in damage and displacing over 8,000 people. A significant factor contributing to these fires is the electric grid, where interactions between power lines and vegetation can spark fires, threatening critical infrastructure.

Presenting complex research in a limited time frame can be a daunting task, as Michelle discovered while preparing for the SLAM competition.

"The most challenging aspect of presenting my research in a SLAM format was creating a concise and

SLAMMIN' IT WITH SCIENCE — From left, Sandia postdocs Daniel Vigil, Michelle Bester, and Alex Boehm showcase their research at the Rio Grande Research SLAM.

Photo courtesy of Los Alamos National Laboratory

engaging script that could be understood by a diverse audience in just three minutes with only one visual aid," she said. "Balancing content and delivery were the hardest part."

Alex Boehm: Beyond silicon

Alex Boehm's presentation, "Beyond Silicon: The Next Generation of Electronics," explored the future of technology. He highlighted the national security risks posed by the U.S. reliance on foreign silicon, the backbone of modern electronics. Alex introduced promising alternatives, such as 2D materials, which are ultra-thin and poised to revolutionize the electronics industry. His research aims to integrate these materials into practical devices, fostering technological independence.

"Communicating technical scientific concepts to nonexperts is a crucial skill for early-career researchers," Alex said. "Events with constrained formats help us refine these skills and offer valuable low-stakes opportunities for experience and feedback."

Daniel Vigil: Innovations in battery technology

Daniel Vigil presented his research titled "Lithium-ion batteries are flammable, but polymer electrolytes may help." He explained how solid polymer electrolytes offer greater stability and mechanical properties compared to traditional liquid electrolytes. By mixing self-assembled polymer electrolytes with a small amount of liquid electrolyte, his team developed new materials that enhance lithium-ion conductivity. They also used computer simulations to uncover the mechanisms behind this improved performance.

"The event helps presenters hone the ability to communicate complicated science at a level comprehensible to the public and motivates early-career researchers to share their work," he said.

A platform for innovation and collaboration

The Rio Grande Research SLAM, initiated by Academic Programs postdoctoral lead Tracie Durbin in partnership with the Air Force Research Laboratory, Los Alamos National Laboratory, and New Mexico Established Program to Stimulate Competitive Research, or EPSCoR, showcases the innovative spirit of the research community.

"The SLAM not only highlights groundbreaking work across diverse fields but also fosters engagement and knowledge sharing, ultimately driving progress and inspiring the next generation of researchers," Tracie said.

This year's event not only celebrated innovative research but also emphasized the importance of effective communication in science. By challenging participants to summarize complex ideas into concise presentations, the SLAM encourages collaboration and knowledge sharing that is essential to advance science and technology.

As the Rio Grande Research SLAM continues to grow, it invites more researchers to participate, share their discoveries and engage with the community. This event is a testament to the power of communication in science and its role in shaping a brighter future for all.

Sandia helps students branch out into STEM

STEM Day another success for Sandia California

By **Michelle Walker-Wade**

For the second year, Sandia's Community Involvement partnered with the Tri-Valley Branch of the American Association of University Women to sponsor a day of STEM.

The event, held March 8 at Las Positas College in Livermore, featured a day for fourth- and fifth-grade youth to learn about science, technology, engineering and math.

This year's event grew in size to 55 attendees, an increase from 41 in 2024.

STONE SLEUTHS — Sandia materials scientist Emma Otti teaches students to identify mineral stones by hardness, luster, powder streaks and breakage tendency. **Photo by Spencer Toy**

SMILING SCIENTISTS — Students talk about the Ozobots raceway activity during STEM Day at Las Positas College in Livermore. **Photo by Spencer Toy**

STEM SACK — A student sports a STEM Spark Your Curiosity bag during the event. **Photo by Spencer Toy**

SHAKE, ROBOT DOG — A student gives the handshake command to Chip Watson, a quadruped robot. **Photo by Spencer Toy**

Mileposts


Lawrence Trost 45


Lawrence Irwin 35


Pam Mckeever 35


Carl Vanecek 35


Robert Bernstein 25


James Duncan 25

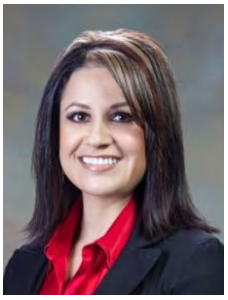

Sarah Goke 20


Ben Hamlet 20

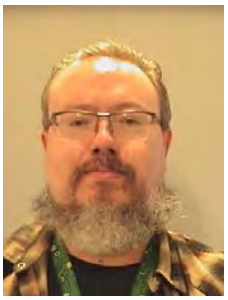

Brenna Hautzenroeder 20

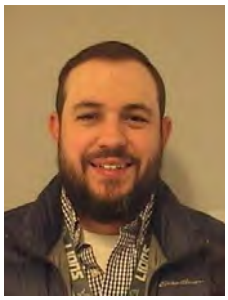

Benjamin Jaseph 20


Michael Kline 20


Brenda Ochoa 20

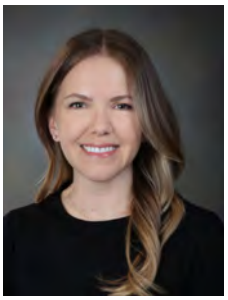

Jon Snell 20


Lyle Beck 15


Nathan Foust 15


Jamie Levy 15


Pauline Marquez 15


Meghan Van Den Avyle 15


Todd Zeitler 15

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Cap Fritz 23


Dean Klassy 12


Wendy Dolstra 35