



S A N D I A

LAB NEWS

PUBLISHED SINCE 1949

Vol. 74, No. 22, Dec. 8, 2022

Answering
the call
Page 7

Chat with HR	9
Electric car race	10
Mileposts	12
Patents	13



HAVE A NICE FLIGHT — The new TeMale III sounding rocket, designed and provided by Sandia's High Operational Tempo for Hypersonics program, takes off from NASA's Wallops Flight Facility, carrying payloads and scientific instruments to inform hypersonic weapon design.

Photo by Mark Olona and Michael Bejarano

Successful sounding rocket campaign advances hypersonic weapon tech for Navy, Army

New vehicle imitates boost-glide trajectory for over a minute

By **Troy Rummler**

Sandia's High Operational Tempo for Hypersonics team successfully executed another flight test campaign to inform hypersonic weapon design for the U.S. Navy and Army. The team flew two precision sounding rockets carrying a total of 24 experiments Oct. 26-27 from NASA's Wallops Flight Facility in Virginia.

The flight campaign supported the Navy's Conventional Prompt Strike and the Army's Long Range Hypersonic Weapon offensive programs. The Missile Defense Agency also gathered data from the tests to help develop defensive systems

against hypersonic weapons.

The pair of launches is the second campaign for the Sandia team, which executed its **first campaign** in October 2021. Over the yearlong course of the campaign, the team designed and flew an entirely new three-stage sounding rocket, launched in a highly depressed trajectory intended to represent the hypersonic boost-glide flight path of larger, more expensive weapons systems.

"This vehicle was a revolutionary success, spending approximately one minute above Mach 9 in a relevant altitude band, which is an unprecedented accomplishment for a sounding rocket," said Ben English, who leads the High Operational Tempo for Hypersonics team. The vehicle survived a total of 85 seconds in a relevant flight environment.

— CONTINUED ON PAGE 3

A smart collar to catch carbon dioxide leaks

Sandia system to check up on carbon sequestration sensors

By **Mollie Rappe**

Sandia engineers are working on a device that would help ensure captured carbon dioxide stays deep underground — a critical component of carbon sequestration as part of a climate solution.

Carbon sequestration is the process of capturing CO₂ — a greenhouse gas that traps heat in the Earth's atmosphere — from the air or where it is produced and storing it underground. However, there are some technical challenges with carbon sequestration, including making sure that the CO₂ remains underground long term. Sandia's wireless device pairs with

— CONTINUED ON PAGE 6



KEEPING A LID ON CO₂ — Click to watch an animation of Sandia's smart collar detecting a leak from a carbon dioxide storage reservoir.

Animation by Max Schwaber

Managed by NTESS LLC for the National Nuclear Security Administration

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Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Published on alternate Thursdays by Internal, Digital and Executive Communications, MS 1468

LAB NEWS ONLINE: sandia.gov/LabNews

TABLE of CONTENTS

- 1 | Successful sounding rocket campaign advances hypersonic weapon tech for Navy, Army *continued on page 3*
- 1 | A smart collar to catch carbon dioxide leaks *continued on page 6*
- 2 | National Hispanic in technology award honors Sandia engineer
- 4 | DOE funds pandemic tracking software to prepare for future outbreaks
- 7 | Answering the call
- 8 | STEM soars at the Discovery Festival
- 9 | Getting chatty
- 10 | Electric car challenge sparks enthusiasm
- 12 | Mileposts
- 13 | Patents
- 13 | SWAN serves up spaghetti, support at Ronald McDonald House

LABNEWS Notes

Lab News may contain photos shot prior to current COVID-19 policies. Individuals in photos followed all social distancing and masking guidelines that were in place when photos were taken.

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 Lab News editor Katherine Beherec at kgbeher@sandia.gov.

National Hispanic technical honor goes to Sandia engineer

Rudy Garcia's software, remote sensing work earns award



SOCIETY SUPPORTER — Rudy Garcia said the Society of Hispanic Professional Engineers prepares Hispanic students and professionals to lead in engineering and science fields.

Photo courtesy of the Society of Hispanic Professional Engineers

By **Luke Frank**

Sandia data engineer Rudy Garcia received the 2022 Society of Hispanic Professional Engineers Technical Achievement and Recognition, or STAR, Award for his work in research and engineering of large software systems and remote-sensing applications, along with his expertise in cloud computing and big geospatial-data architectures.

The Hispanic in Technology, Government, STAR award honors outstanding professionals and students for their dedication, commitment and selfless efforts to advance Hispanics in STEM careers. Rudy, who has been with Sandia for nearly 25 years, developed and executed the Overhead Persistent Ground Architecture Data Integration and Exposure project, a one-stop-shop for tasking, collecting, processing, exploiting and disseminating metadata. The

project provided transparency, fast search results and standardized interfaces that dramatically accelerated metadata results for government analysts. Rudy has also been a vital contributor in Sandia research areas that include space programs, cloud computing, data standards and satellite ground systems.


"I couldn't have accomplished what I have without my family, friends and colleagues," Rudy said. "I was the first in my immediate family to attend college and graduate with a bachelor's and master's degree in computer engineering. Being recognized at the national level with the Hispanic in Technology award is truly one of my proudest career achievements."

In addition to recognizing Hispanics in work and research, the STAR awards recognize those in STEM who are changing lives through their community outreach.

"I'm a native New Mexican and want to help my community," Rudy said. His involvement in Hispanic Outreach for Leadership and Awareness, Hispanic

Heritage Month, MANOS, Noche de Ciencias, Hands-On Minds-On Technologies sessions for middle school and high school students, and other community service organizations speaks to his commitment to improving opportunities for local students and colleagues alike.

"I feel it's important to be a role model for future Hispanic students considering engineering or science," Rudy said. "I was introduced to the Society of Hispanic Professional Engineers a long time ago, and through the organization I could see and relate to other Hispanics and some of their challenges in pursuing an engineering degree. The society provides and prepares Hispanic students and professionals opportunities to lead in engineering and science fields."

Rudy said his time with the society has helped him to complete his education and with hard work, determination and persistence, become a distinguished research and development technical staff member at Sandia. 



VISIONARY DATA ENGINEER — Data engineer Rudy Garcia said his greatest professional strength is the ability to see the big picture and work collaboratively with his colleagues to meet Sandia's mission.

Photo by Craig Fritz

Hypersonic launch

CONTINUED FROM PAGE 1

The other rocket followed a more traditional, high-arc, lofted trajectory but included numerous advanced flight sequencing events orchestrated to facilitate critical demonstrations for its onboard payloads.

"Our team did a fantastic job raising an already high bar set from last year's campaign," Ben said. "Sandia has a long history supporting complex flight tests, including extensive contributions to hypersonics development, and the incredible efforts of this team throughout this campaign have brought another highly effective tool into our nation's testing and development arsenal. What that means for the Labs is that I can talk to potential sponsors or partners who are getting more interested in these kinds of high-intensity flights and say without hesitation, 'Yeah, we can do that.'"


Sounding rocket programs at Sandia date back to atmospheric nuclear weapons tests in the 1950s. During those experiments, several rockets carrying scientific instruments would record data about atomic blasts. The current rockets, on the other hand, help to rapidly mature hypersonic systems technologies, such as a nose tip provided by Oak Ridge

National Laboratory incorporating advanced materials.

The frequency and affordability of the sounding rocket launches helps these technologies grow more mature before the Navy and Army programs field a final weapon system design, according to a Navy news release.

"Several of the payloads flown on these tests will transition directly to tactical weapon systems upgrades based on the pedigree and demonstrated performance observed on these flights," Ben said.

Other payloads, including navigation and communications equipment, were provided by Conventional Prompt Strike, the Missile Defense Agency, the Army Hypersonic Program Office, the Joint Hypersonic Transition Office, Sandia, the Applied Physics Laboratory at Johns Hopkins University and several defense contractors.

Sandia is the lead research agent for the common hypersonic missile that will be fielded by both the Navy and Army with tailored launchers. The Labs designed the common hypersonic glide body that is attached to a rocket booster and launched into the upper atmosphere before gliding to a target at more than five times the speed of sound. 

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DOE funds pandemic tracking software to prepare for future outbreaks

By **Michael Ellis Langley**

The DOE has awarded \$5 million to create tools that increase the nation's preparedness for biological threats — including an infection-rate tracking program for COVID-19 developed by a Sandia team in 2020.

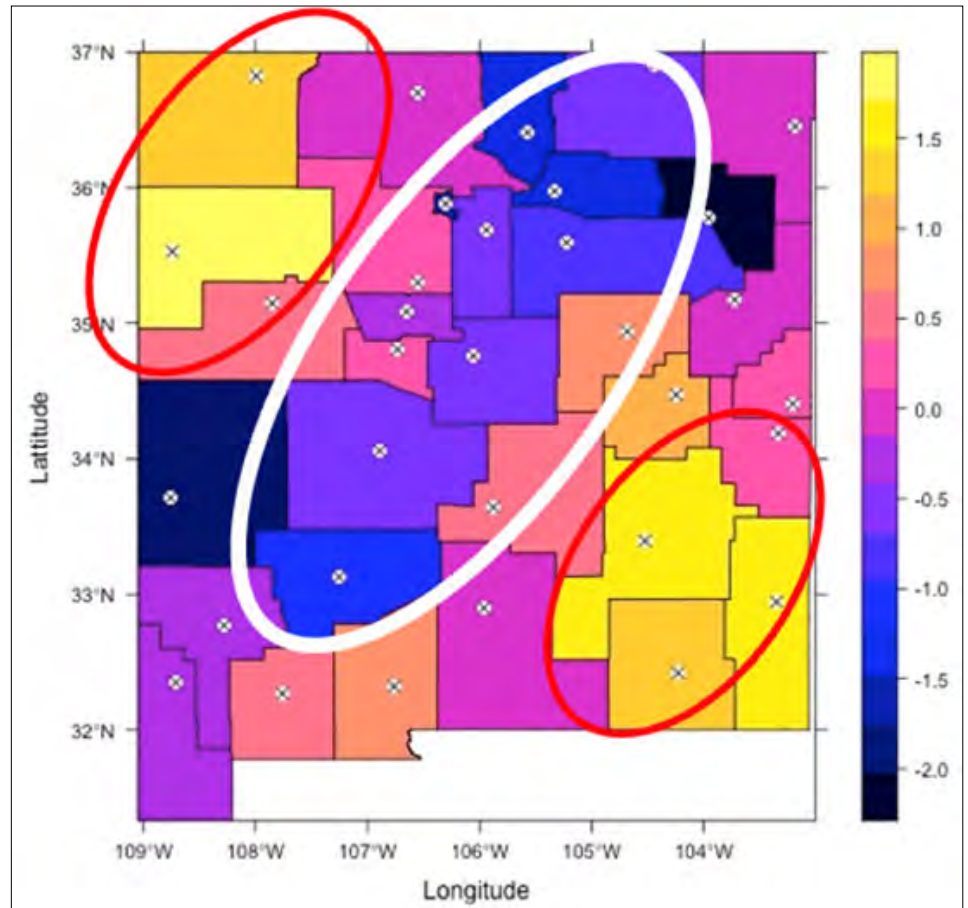
Sandia researchers Jaideep Ray and Cosmin Safta developed an approach using publicly available data from states to **track and predict outbreaks of COVID-19** in large populations. Since then, they have refined their model to track infection rates at the county level, where infection rates and case counts start small.

“You may not get hundreds of people infected or coming in sick every day, especially during the early days of an outbreak. You may get 10 to 12, which is what we’ve seen for counties like Bernalillo and Valencia in New Mexico,” Jaideep said. “If you get about five to 10 people coming in sick every day, we can figure out how fast the disease is spreading, and we can forecast how it’s going to move in the next two weeks.”

That kind of specificity is vital to learning to stop outbreaks before they have a chance to spread. In 2020, Jaideep and Cosmin were able to forecast the short-term spread of COVID-19, allowing public health agencies to plan medical resources for epidemiological hotspots.

“Given that humans are now coming into contact with new animal species, which are migrating with the changing climate, there are new diseases that will be coming over to the human species over and over again,” Jaideep said. “This is just the beginning of many potential pandemics. But a pandemic could be detected early and stopped right away before seriously impacting the nation, as COVID-19 did.”

In June, DOE’s Office of Science



PANDEMIC FORECAST — A color-coded map of New Mexico uses data from 2020 to illustrate a drop in COVID-19 infection rates in counties that are darker colors and an increase in cases in counties that are lighter colors. Sandia researchers Jaideep Ray and Cosmin Safta’s predictive program can help emergency service providers plan resources.

Illustration by Jaideep Ray and Cosmin Safta

established a Bio-preparedness Research Virtual Environment **initiative** to plan for future events and put out a call for proposals to advance work that can provide early warning. The Sandia team partnered with researchers from **Argonne National Laboratory**. Their joint proposal was accepted in August with a total project award of \$825,000 a year.

“The first thing we want to do is try to make the model less computationally expensive,” Jaideep said, explaining the goals for the next two years. “The second thing that we are going to do is look at the question: If you had the beginnings of an outbreak, and it’s infected 30 or so people in a small village of 100 or 200

people, can we use that data to infer the mechanism of human-to-human transmission and what the spread rate is? In other words, does the new disease have the potential to become a pandemic?”


Finally, the team will refine an agent-based modeling tool developed at Argonne. This computational framework looks at individual or group interactions through the lens of game theory, evolutionary programming, sociology and similar analysis methods to model the spread of an outbreak — including scenarios where public health restrictions have been instituted. Such models are invaluable in evaluating the efficiency of potential public health countermeasures

in slowing an outbreak versus the disruption they would cause.

“If a disease has traveled across families, can you use data and computer modeling to identify the social links over which it progressed? It’s called tracing the chains of transmission and yields information on the mechanism of transmission — but can you get a computer, rather than public health personnel, to do it?” Jaideep said. “The work at Sandia is very focused on extracting such information from data. Argonne has been at the other end of things, using this information — the rate and mechanism of disease spread — in agent-based modeling to figure out ways in which the disease’s spread could be slowed or stopped, while minimizing the disruption to daily life.”

Jaideep hopes that the combination of the two approaches will allow the labs to model human social interactions on an individual level accurately, perhaps predicting how fast diseases can spread in different situations and what factors might curb the spread of biothreats.

“We’ll be using data to ‘back out’ how fast a novel disease jumps from person to person, and the social links facilitating that transmission. This is something we started 13 or 14 years ago. People are very interested in that kind of work now because it tells you the mechanism and route of disease spread — and therefore a weak link where you could potentially break the chain of transmission.”

Such a breakthrough, funded through this research grant, might one day help the nation avoid the debilitating and deadly impacts of the next pandemic. 



Before
you
head out...

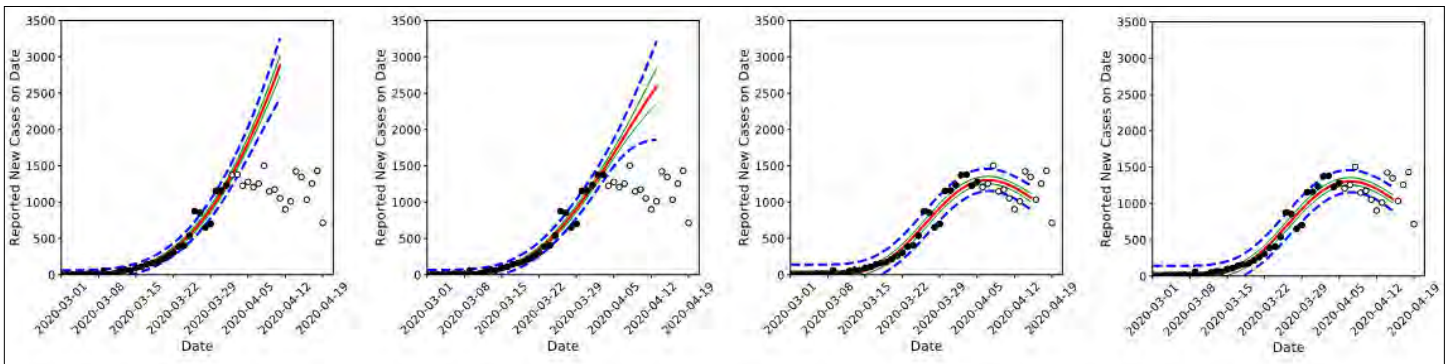
For winter break,
think about the people
who made this year great.

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DATA DRIVEN — Weekly predictions of infections in March and April 2020 are indicated by the dots on the right side of each graph. The solid lines show the actual infection rate during nationwide lockdowns, which match the Sandia predictions.

Illustration by Jaideep Ray and Cosmin Safta

Smart collar

CONTINUED FROM PAGE 1

tiny sensors to monitor for CO₂ leaks and tell aboveground operators if one happens — and it lasts for decades.

“The world is trying a whole lot of different ways to reduce the production of CO₂ to mitigate climate change,” Sandia electrical engineer and project lead Andrew Wright said. “A complementary approach is to reduce the high levels of CO₂ in the atmosphere by collecting a good chunk of it and storing it deep underground. The technology we’re developing with the University of Texas, Austin aims to determine whether the CO₂ stays down there. What is special about this technology is that we’ll be monitoring it wirelessly and thus won’t create another potential path for leakage like a wire or fiber.”

Storing and sensing CO₂

In carbon sequestration, CO₂ would typically be stored 3,000 to 12,000 feet below the surface in an area that once contained oil, gas or water, Andrew said. A hole would be bored down through an impermeable layer of rock called cap rock that can prevent CO₂ from percolating up toward the surface. Pressurized CO₂ heated to around 175 degrees Fahrenheit would be pumped down this borehole. In some cases, it will be heated up to prevent it from freezing when it expands into the area, Andrew said. Once the storage area is full, the borehole would be plugged, and in some cases, the trapped CO₂ would react with the rock and bind permanently.

The team, led by geoscientist David Chapman at University of Texas, Austin, plans to embed glitter-sized CO₂ sensors, about an 1/8 of an inch by an 1/8 of an inch, in the concrete surrounding the borehole, above and below the cap rock layer. Electrical engineer Axel Scherer at the California Institute of Technology is leading the group making the glitter-sized CO₂ sensors. Chemist Jeff Mecham at the Research Triangle Institute is leading the group making a coating to protect the sensors from the harsh environment of concrete, while still allowing CO₂ to reach the sensors.

Sandia’s role is to make an electronic device that charges the CO₂ sensors, receives information from them about the presence or absence of CO₂ and sends that information up to operators at the surface. This device, called a smart collar, needs to work for 20 to 40 years, Andrew said.

Making a smart collar

The communication with the CO₂ sensors works like the radio-frequency identification chip in a tap-to-pay credit card, Andrew said. The smart collar emits energy at one radio frequency to power the CO₂ sensors. The sensors collect data on the amount of CO₂ around them and send that information to the smart collar at a different radio frequency.

“There’s no power or battery in your credit card,” Andrew said. “Instead, when you tap it onto the reader at the supermarket, the reader energizes the chip. The chip relays some

information to the reader, and that’s what allows you to buy your groceries.”

One of the biggest technical challenges the team had to overcome was the fact that RFID chips aren’t designed to be embedded in concrete, Sandia electrical engineer and project team member Alfred Cochrane said.

To power the sensors through concrete, the team needs to “shine” very intense radio waves of a certain frequency at the sensors. However, much of these radio waves reflect off the concrete, drowning out any information from the sensors at that frequency, Alfred said. He suggested they try to power the sensors with one frequency and then use far less intense radio waves of a different frequency to query the sensors and receive information back from them. This worked well in their tests, he added.


Recently, the Sandia team successfully showed the smart collar prototype powering and communicating with off-the-shelf RFID chips embedded in an inch of cement, a major component of concrete. For the smart collar to last for decades, the team designed the prototype to use supercapacitors to store power rather than batteries that only last for a couple of years. Next, the team will test the smart collar prototype with Caltech’s CO₂ sensing chips.

The Sandia team has also tested powering and communicating with their smart collar prototype through 160 feet of commercially available wired pipe. This pipe has coaxial cable, very similar to that used in cable TV, embedded within it, so that the system won’t need any other wires or cables that could introduce new escape routes for the CO₂, Alfred said.

Later next year, the goal is to demonstrate the whole system — Caltech’s chips and Sandia’s smart collar — first at Sandia’s aboveground testing facility and then at the University of Texas, Austin underground test facility. University of Texas, Austin geoscientist Mohsen Ahmadian is the lead for the underground testing part of the project.

While the focus of this project is on carbon sequestration, the technology could also be used to monitor storage areas for natural gas or even hydrogen, Andrew said.

“There’s way too much CO₂ in the atmosphere right now and it’s only getting worse,” Alfred said. “Along with all the other technologies like renewable energy, carbon sequestration is an active approach to mitigating climate change. If you capture carbon from a coal-fired power plant or a cement plant and store it indefinitely, you could make those processes carbon neutral or even allow us to go carbon negative and remove more CO₂ than we emit.”

The project is funded by DOE [Office of Fossil Energy and Carbon Management](#) and the [National Energy Technology Laboratory](#). 

Answering the call

Sandians support national security mission

With this final edition of the year, Lab News concludes its “Answering the call” special profiles that highlight the Nuclear Deterrence Modernization Rally Cry. The series showed how dozens of Sandians from different backgrounds — doing various jobs at many stages of their careers — all contribute to the Labs’ national security mission.

Read more profiles from [previous editions](#).

Photos by **Craig Fritz**

Joanna Lewis

*Quality technologist
41 years at Sandia*

Joanna started working as a microelectronics assembly operator in 1983 after graduating from high school in Albuquerque.

“I’ve learned so much at Sandia,” said Joanna, now a quality assurance expert focusing on NNSA product acceptance at Sandia’s Microsystems Engineering, Science and Applications center.

Joanna works in the areas of trusted microelectronic production capabilities, explosive technologies and advanced product realization, which are key to maintaining the safety, security and use control of the nuclear stockpile. She increased her responsibilities this year to share her knowledge with newer staff members to improve product acceptance volume without sacrificing quality. Her tailored approach has helped these teams meet critical security needs in less time.

“I want to do the best I can, and one person can make a big difference when they teach others. I am proud to be contributing to weapon stockpile and national security. I’m not ready



to retire. I like what I do, and there are opportunities to make things better. I’m still here after 40 years and wouldn’t be anywhere else.”

— Jill Janov-Kelly

Alexandra Robinson

*Health physicist and radiation protection manager
13 years at Sandia*

Alexandra is experienced in protecting people and our environment from radiological hazards, while making it possible to enjoy radiation’s many uses and benefits.

Radiation is encountered in a wide spectrum of national security, nuclear deterrence and nonproliferation projects across the DOE complex, and health physicists like Alexandra partner to ensure its safe and compliant use by employing knowledge across physics, biology, chemistry and engineering to enable Sandia’s national security mission success.

Alexandra is committed and passionate about developing radiation protection professionals critical to Sandia’s mission essential work.

“Nationally, students graduating in health physics has declined from 270 in 1995 to less than 50 in 2021, and my focus is to position Sandia to attract and retain talented radiation protection professionals by establishing our internship program, building partnerships with educational institutions and developing our program’s visibility at all levels.

“I believe that given the ability to truly experience and understand the impactful opportunities available at Sandia in the field of health physics that allow for personal contribution to our national security, candidates will choose to be a part of the Sandia radiation professional team now and into the future.”

— Karli Massey



Pete Marleau

Physicist

16 years at Sandia

While Pete trained in experimental high-energy physics, at Sandia he designs and fabricates radiation detectors for field use.

“We work on a variety of missions: nuclear emergency response, nuclear safeguards and arms control, which has always drawn me because there are very challenging problems specific to the field,” he said.

Pete has led international working groups through NNSA’s Office of Nuclear Verification. One collaborates to understand signatures of warheads and ways to design

detectors to confirm them for arms control treaties. Working with the U.K., Sweden and Norway he co-chairs a working group seeking to understand verification equipment and instrumentation that might be used to generate trustworthy data to support future treaties. The work, in part, helps meet signatory obligations under the nuclear Non-Proliferation Treaty. The team briefed the work at the NPT Review Conference at the United Nations in August.

Pete is also on the management team for a new arms control verification and monitoring effort, a multilab venture expected to reach \$75 million over the next five years. As science integration lead, he will identify scientific challenges in arms control verification and help direct research and development to come in future phases, beginning in March.

— J.C. Ross

Steve Montgomery

Lead assessor

8 years at Sandia

Flying coast to coast assessing companies that supply technical products to Sandia, Steve is an expert in quality management systems and airports.

“A lot of airports are kind of generic — not a lot to look at,” said Steve, who averages more than a trip per month and just completed his 100th assessment. “Albuquerque is pretty unique. It has a local flavor. ... They have balloons on display right now.”

In-person visits help ensure Sandia receives what it needs and allow Steve to see beyond mandatory documentation, he said.

“When you’re talking to them face to face, you can see, do they

understand, or do they not understand?” Steve said.

Steve worked in aircraft engine manufacturing and unmanned vehicle computing with General Electric Co. before joining Sandia and said he appreciates the variety inherent in his job.

“If you’re in industry, you’re kind of producing one thing,” said Steve, who added working with Sandia’s talented professionals is his job’s best part. “Doing assessments draws from the wide experience of a team with lots of different backgrounds. If we have questions about what our suppliers are doing, or how they’re doing it, we can call in the expertise that exists across Sandia.”

— Myles Copeland



Photo by Randy Wong



STEM soars at the Discovery Festival



STEM TAKES FLIGHT — Mechanical engineers Alex Chen, left, and Austin Hamlett volunteer at the Discovery Festival hosted by Big Brothers Big Sisters of Central New Mexico on Nov. 18. Alex and Austin led hands-on science experiments like mixing hot and cold liquids, demonstrating Bernoulli’s principle with hovering ping pong balls and shifting the center of mass to improve flight stability of a paper helicopter. Sandia was a sponsor of the educational event that introduces local K-12 students to businesses and job opportunities through interactive activities and discovery.

Photo by Katrina Wagner

Getting chatty

HR Solutions' new chat function helps Sandians get answers

By **Shelley Kleinschmidt, Mariah Martinez and Johann Snyder**

What if you had a question for a company and there were several ways to get an answer quickly and efficiently? What if you didn't have to spend valuable time listening to background music while on hold? What if you got the personal, and more importantly, timely response you needed? What if all of that wasn't a hypothetical "what if" but a reality right now?

HR Solutions is changing the way it connects with people who have questions, offering more ways to get support from their team members, so that more of your questions are answered when you need it. Less waiting, more personal attention and more answers, and it's available now from HR Solutions. A new chat feature debuted in August 2022 allows Sandians to submit questions to HR Solutions and quickly get answers.

For Human Resources Director Rob Nelson, adding the chat feature to the HR Solutions site was a highlight of the year.

"We were super excited to introduce this technology to support Sandians when they need assistance," he said. "We are introducing technology to help (people) regardless of whether you prefer to use call back assist to schedule a return call at a time that works best for you, or whether you need (to chat with) an HR professional to walk you through completing an e-form or finding a resource."

This was an important effort for HR Solutions. "Chat is one of many high-impact milestones in our roadmap to continuously improve the HR Solutions service at Sandia," said IT solutions architect Rich Griego, one of the team members who made the feature possible.

A chat feature has been one of the most requested service enhancements since HR Solutions launched in 2020. Now that it's available, it allows any Sandian with access to the Sandia Restricted Network to chat with an HR Solutions team member about questions on anything HR-related, from benefits to a name change or even telecommuting.

One of the key goals of adding the chat feature was to help improve HR Solutions' abandon rate; that is, lower the number of people who get frustrated and hang up after staying on the line and hearing "your call is very important to us" one too many times.

In November 2021, that abandon rate was 18%, meaning people were giving up and not waiting on the phone to get answers about 18% of the time. Since that time, HR Solutions



MORE WAYS TO CONNECT — HR Solutions has rolled out a chat functionality that allows Sandians to quickly and efficiently get answers to questions for their work and life. The group has noted a significant decrease in abandon rates, the percentage of people who end their sessions with HR Solutions before they receive assistance. **Photo by Craig Fritz**


continued to add new ways for people to contact team members for the answers they need, and now with the inclusion of the chat feature, that abandon rate has gone from 18% to 4%. So, more people are getting their questions answered more often and generally, in a shorter amount of time.

Those numbers not only reflect HR Solutions' desire to continue to improve the experience for their customers but is a great example of a collaborative effort to improve the quality of service at Sandia. "The success of chat is a result of the strong partnership between HR, IT and the employee community we serve," Rich said.

To give the chat feature a try, active Sandians can go to hr.sandia.gov, open the HR Solutions dropdown on the top right of the page and select "Request Chat." The feature isn't currently available to retired Sandians, as a verifiable login to the Sandia Restricted Network is needed for the feature.

However, chat isn't the only way to contact HR Solutions for questions.

Anyone can visit hr.sandia.gov to find answers to questions on topics such as telecommuting, life events or open enrollment. HR Solutions can also be reached at 505-284-4700, and if someone can't answer right away, there's an available call-back assist option to schedule a return call at a more convenient time or leave a voicemail for a return call from an HR Solutions team member. Questions can also be submitted at the "Ask a question" link on the HR website.

There are lots of different ways, depending on your specific need, to contact HR Solutions and get answers to those tricky questions for your life and work. With new features like chat, HR Solutions continues to make that interminable wait while being told "your call is very important to us" a thing of the past. 

Electric car challenge sparks enthusiasm

Twenty-one schools from across the state stage multiple teams

By **Luke Frank**

After a three-year, COVID-induced hiatus, the 2022 New Mexico Electric Car Challenge came roaring back with about 300 middle school participants. Traffic was thick as throngs of kids made their way through the competition, presenting their electric car research and design principles to Sandia judges, and then heading to the drag strip for head-to-head racing.

The statewide challenge, sponsored by Sandia and Los Alamos national laboratories, is a STEM program for students in grades six, seven and eight to build the fastest model electric car capable of holding a payload. Participating schools came

from Albuquerque, Bayard, Carlsbad, Española, Ohkaywingeh, Roswell, Ruidoso, Santa Fe, Taos and White Rock.

Student teams began their work in September, and the event held Nov. 19 at Van Buren Middle School in Albuquerque was the culmination of weeks of compelling exploration connecting science and math with hands-on activities outside of the classroom.

Students used a few required materials and specifications to prepare their cars for the 33-foot dragstrip to glory. Each team was responsible for designing and building a AA alkaline battery-powered model racecar within the following specifications:

- 20 centimeters (7.87 inches) in width.
- 40 centimeters (15.75 inches) in length.
- 20 centimeters (7.87 inches) in height.
- At least 700 grams (1.54 lbs.) in weight.



PIT ROW — Roosevelt Middle School Team 1, which took the checkered flag for overall competition, makes a presentation about their electric car design during the New Mexico Electric Car Challenge.


Photo by Craig Fritz

Other than the above specifications, teams were free to design their car as they liked using whatever materials they chose to build the fastest electric hotrod — plastic foam, cardboard, plastic, balsa wood and more. Students provided the parts, including wheels, car body, axles and gears. Teams were scored on their research, car design and, yes, speed.

“This is a great event that engages kids in science, technology, engineering and math outside of the classroom,” said design judge and Sandia engineer Rudy Garcia. “They have fun learning to work and problem-solve as a team to make their cars as fast and reliable as possible. Their strategies and tactics are well thought out and presented. It’s pretty exciting to be a part of.”

Sandia’s Community Involvement has hosted the challenge for nearly 20 years to create and nurture hands-on design and application fun for a different feel from textbook problem-solving or even traditional science labs. Goals of the program include:

- Present engineering (math and science) concepts in a fun and exciting way.
- Create and develop teamwork and team-building skills.
- Stimulate creative thinking through a hands-on design project.
- Help develop and enhance oral presentation skills.

“These kids bring so much positive energy to this event,” said Deb Menke, community relations specialist at Sandia who organized this year’s event. “They’re very serious about their projects and the competition, but you can see how much fun they’re having, too. Who knows? They could be future engineers.” 

Race results

Overall Competition

- 1st place – Roosevelt Middle School, Albuquerque, Team 1.
- 2nd place – Jefferson Middle School, Albuquerque, Team 3.
- 3rd place – Carlos Vigil Middle School, Española, Team 3.

Research

- 1st place – Roosevelt Middle School, Albuquerque, Team 1.
- 2nd place – Jefferson Middle School, Albuquerque, Team 1.
- 3rd place – Alta Vista Middle School, Carlsbad, Team 2.

Design

- 1st place – Jefferson Middle School, Albuquerque, Team 3.
- 2nd place – Roosevelt Middle School, Albuquerque, Team 1.
- 3rd place – Berrendo Middle School, Roswell, Team 2.

Race

- 1st place – Carlos Vigil Middle School, Española, Team 3.
- 2nd place – Carlos Vigil Middle School, Española, Team 2.
- 3rd place – Alta Vista Middle School, Carlsbad, Team 2.



AIMING FOR FIRST — Chance Bonham, 12, from Berrendo Middle School in Roswell, launches his team’s electric car during the New Mexico Electric Car Challenge.

Photo by Craig Fritz

Mileposts



Jerome Cap

40



Richard Howe

40



Mark Brynildson

35



David Gardner

35



Richard Baird

25



Stan Hall

25



Colin Hamman

25



John Rodriguez

25



Mike Holmes

20



Steve Jorgensen

20



Steve Kubica

20



Mike Montoya

20



Val Weekly

20



Jason Wertz

20



Brian Byers

15



Andrea Heacock-Reyes

15



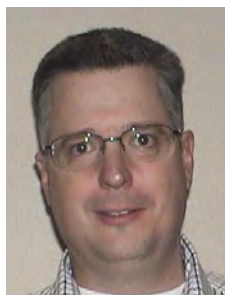
Sabrina Lujan

15



Mark Monda

15



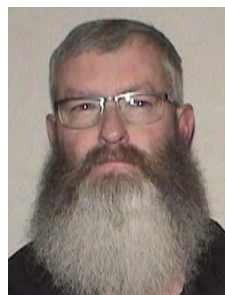
Nathan Nowlin

15



Seth Root

15



Kevin Youngman

15

Recent Retirees



Louise Criscenti

20

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Giphy
giphy.com/SandiaLabs

Recent Patents

July-September 2022

- **Andrea Ambrosini and Eric Nicholas Coker:** Redox-active oxide materials for thermal energy storage. Patent #10800665
- **Kyle Chris Klavetter, Tina M. Nenoff, Carlos Perez and Michael P. Siegal:** Electrochemical detection of gas phase chemicals. Patent #11378547
- **Darren W. Branch:** Detection of bioagents using a shear horizontal surface acoustic wave biosensor. Patent #11378576
- **Lincoln Collins, John P. Korbin, Carianne Martinez, Kevin Matthew Potter, Scott Alan Roberts, Matthew David Smith and Charles Snider:** Uncertainty-refined image segmentation under domain shift. Patent #11379991
- **Christopher Nordquist:** Hybrid piezoelectric microresonator. Patent #11387802
- **Jay Tillay Johnson:** Systems and methods for detecting and mitigating cyber attacks on power systems comprising distributed energy resources. Patent #11388178
- **Bryan James Kaehr:** Battery cell with safety layer. Patent #11394091
- **Darren W. Branch, James Kenneth Douglas, Thomas A. Friedmann, Christopher Nordquist and Aleem Mohammed Siddiqui:** Solid-state tuning behavior in acoustic resonators. Patent #11405014
- **Michael Gehl and Christopher Michael Long:** Phase-wrapping method for beam steering in optical phased arrays. Patent #11409183
- **James Bradley Aimone, Richard B. Lehoucq, Ojas D. Parekh and William Mark Severa:** Devices and methods for increasing the speed and efficiency at which a computer is capable of modeling a plurality of random walkers using a density method. Patent #11409922
- **Brandon Lee Ennis and Joshua Paquette:** Towerless vertical-axis wind turbine. Patent #11421650
- **Evan Michael Anderson, Andrew David Baczewski, Aaron Michael Katzenmeyer, Shashank Misra and George T. Wang:** Photolithography of atomic layer resist. Patent #11424135
- **Ihab Fathy El-Kady, Michael David Henry and Rupert M. Lewis:** Superconductivity device comprising a phononic crystal. Patent #11424400
- **Rick A. Kellogg, Marshall Stewart Klee, Michael E. McReaker and Bradley Salzbreinner:** Hermetic edge-connect headers and corresponding connectors. Patent #11424572
- **Oscar Negrete and Joseph S. Schoeniger:** Lipid composition for the delivery of therapeutic cargos. Patent #11433121
- **David Ames, Andrew Kustas and Salvador B. Rodriguez:** High entropy alloys, refractory high entropy alloys, methods of selecting and making, and structures formed thereof. Patent #11434551
- **James Bradley Aimone, Stephen Joseph Verzi and Craig Michael Vineyard:** Anomaly detection with spiking neural networks. Patent #11436475
- **Elliot James Fuller and Albert Alec Talin:** Thermally sensitive ionic redox transistor. Patent #11450802
- **Singh, Seema:** Engineered hosts with exogenous ligninase and uses thereof. Patent #11453895

Note: Patents listed here include the names of active Sandians only; former Sandians and non-Sandia inventors are not included.

Following the listing for each patent is a patent number, searchable at the U.S. Patent and Trademark Office website ([uspto.gov](https://www.uspto.gov)).

SWAN serves up spaghetti, support at Ronald McDonald House

Photos by Kara Komula



CARE PACKAGES — From left, mechanical engineer Caroline Winters, mechanical engineer Dana Turon, quality engineer Linda Flores, systems engineer Melinda Ramirez and global security intern Sariah Jurado pack care kits that will be gifted to families when they are ready to leave Ronald McDonald House.



SPAGHETTI SUPPER — From left, cybersecurity researcher Danny Loffredo, ES&H coordinator Shemara Purto, contractor Jacquilyn Weeks and systems analyst Amanda Wright cook dinner in the kitchen at the Ronald McDonald House. The group served spaghetti, vegetables and desserts like donuts, rich crispy treats and sugar-free popsicles.



TEAMING UP FOR GOOD — Volunteers with Sandia Women's Action Network, from left to right, quality engineer Linda Flores, postdoc Jessica Kopatz, ES&H coordinator Shemara Purto, mechanical engineer Dana Turon, global security intern Sariah Jurado, ES&H coordinator Kara Komula, mechanical engineer Caroline Winters, cybersecurity researcher Danny Loffredo, systems engineer Melinda Ramirez, systems engineer Carmen Copeland, contractor Jacquilyn Weeks, systems analyst Amanda Wright and Caitlin White, daughter of ES&H coordinator Kirsten White. The group cooked a hot meal, assembled gift bags and wrote encouraging notes for families staying at the Ronald McDonald House in Albuquerque last month.

Photo courtesy of the Ronald McDonald House



THOUGHTFUL DESIGNS — Volunteers like Dana, top, and Caroline create pictures, cards and bookmarks for families staying at the Ronald McDonald House. The Ronald McDonald House provides overnight stays to families whose children are receiving lifesaving treatments at nearby hospitals.



INSPIRING DESSERTS — Volunteers Carmen, left, and Caitlin decorated donuts with encouraging messages for families staying at the Ronald McDonald House.



GROCERY RUN — Software systems engineer Danan High shops for ingredients to make a hot meal for families at the Ronald McDonald House in Albuquerque.