



Material helps extinguish solar panel fires before they ignite

Albuquerque company works with Sandia to develop special polymer for flame prevention device

By **Manette Newbold Fisher**

As solar panels become popular and their voltages increase, there is a need to have built-in capabilities that can extinguish fires caused by arc faults, which are high-power discharges of electricity that can create explosions or flash events due to damaged wires.

Sandia researcher Kenny Armijo has spent 10 years working alongside other researchers at the Labs and Albuquerque company **Guardian Sensors Inc.** to understand and characterize these hazardous arc faults. Their work led to the development of electrical in-line connectors that automatically predict and prevent photovoltaic arc faults before they can ignite electrical fires.

“As solar panels become more efficient, they’re able to produce more power,” Kenny said. “More power means that they’re going to have higher current and higher voltage levels. As you increase the current and voltage levels in next-generation solar panels, it becomes a bit more dangerous because as you increase the voltage, you get a higher propensity for arc faults. This new self-extinguishing mechanism could solve that problem.”

The in-line connector developed by Guardian Sensors — about an inch long and the diameter



ARC FAULT PREVENTION — Sandia researcher Kenny Armijo uses an arc-fault generator developed by researchers to determine how dangerous arc faults are. **Photo by Bret Latter**

of a dime — contains a metal spring covered in a special type of self-extinguishing polymer material developed and tested at Sandia over the past five years. Like current connectors, the self-extinguishing mechanisms would link a series of solar panels like a string of Christmas lights that could operate together in a field or on a roof.

All connectors are susceptible to corrosion, damage or improper installation, which can lead to reliability issues, especially if there are

tiny crevasses or breaks in the wires. Currently when this happens, sparks and devastating fires can occur when high current and voltage run through damaged connectors, and unfortunately, there isn’t a completely reliable way for the connectors themselves to prevent the danger. That’s where the new device would fill that gap, Kenny said.

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B61-12 DROP — An F-35A Lightning II opens its bomb bay doors and drops a mock B61-12 at Sandia’s Tonopah Test Range.



SUCCESSFUL DESCENT — An inert B61-12 will strike the desert floor at Sandia’s Tonopah Test Range about 42 seconds after being released by an F-35A fighter jet.

Images courtesy of Sandia National Laboratories

Flight tests to show B61-12 compatibility with new USAF fighter jet

Versatile Sandia design tested with most advanced multirole fighter jet

By **Michael J. Baker**

A mock B61-12’s strike in the dusty Nevada desert successfully completed the first in a series of flight tests with the U.S. Air Force’s newest fighter jet, demonstrating the bomb’s first release from an internal bomb bay at greater than the speed of sound.

The flight test of the B61-12 with the **F-35A Lightning II** this summer was the first ever at Sandia’s Tonopah Test Range featuring the fighter jet. It was also the first of a testing series that will conclude with full-weapon systems demonstrations designed to increase confidence the bomb will always work when needed and never under any other circumstances.

“We’re showing the B61-12’s larger compatibility and broader versatility for the country’s nuclear deterrent, and we’re doing it in the world of COVID-19,” said Steven Samuels, a manager with Sandia’s B61-12 Systems Team. “We’re not slowing down. We’re still moving forward with the B61-12 compatibility activities on different platforms.”

In partnership with NNSA, Los Alamos National Laboratory and the Air Force, Sandia

completed a B61-12 **full-weapon system demonstration** with the **F-15E Strike Eagle** fighter jet in March, and another in July with the Air Force’s **B-2 Spirit** bomber.

Sandia is the design and engineering lab for non-nuclear components of the nation’s nuclear stockpile, including the B61-12. In addition to non-nuclear component development, Sandia serves as the technical integrator for the complete weapon, assuring the system meets requirements as a full-weapon system.

Showing the bomb’s real-world capability

During the Aug. 25 flight test, an F-35A flying faster than the speed of sound dropped a B61-12 — containing non-nuclear and mock nuclear components — from about 10,500 feet above Tonopah Test Range. The inert B61-12 struck the desert floor in the designated target area about 42 seconds later.

“We successfully executed this historic, first-ever F-35A flight test at Tonopah Test Range within the specified delivery criteria,” said Brian Adkins, range manager at TTR.

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Records fall in 2020 Do-It-Yourself DOE Mile

Sandia's Albuquerque site wins big as labs across DOE complex compete for fastest mile

By Joy MacPherson

Sandia's Albuquerque site was the big winner in the 2020 Do-It-Yourself DOE Mile, winning the men's and the women's mile race and earning a third-place overall finish in both the men's and women's walk. Additionally, the site had the highest participation with 343 run and walk competitors. Ten labs across the DOE complex joined in the fourth annual event, bringing a total of more than 870 runners and walkers, including spouses and dependents.

New race format

The race is normally held as an in-person race on lab campuses across the complex on the same day, but COVID-19 forced a "get out there and do it yourself" format. Between Oct. 1-12, participants had to map out a one-mile course, run or walk the virtual race, and self-report their time. Devices such as Map My Run, Garmin and Strava were used to validate distance and finishing time.

A cross-country running scoring system was used to determine team placing. The top five times from each team/lab received the points that corresponded to their place (first-place runner receives one point, second-place runner two, and so on). The team receiving the lowest score won. Sandia's Albuquerque and Livermore sites were treated as separate teams for the contest.

Men's division

Justin Wiens, the spouse of Sandia's Kristin Divis, clocked the fastest time in the men's run category, coming in at 4:21. Unfortunately for Sandia, Justin's time did not count toward the DOE standings because he is a spouse. This gave the victory to Argonne's Darren Driscoll, with a time of 4:27.

Sandia's Albuquerque site placed their top five runners in the top 13 overall places, giving them a strong win with 35 points and the title of Fastest DOE Lab for the second straight year. Ari Bregman and Samuel Oxandale from the site finished second and third, with times of 4:37 and

Race participation

Lab	Run	Walk	Total
Ames	16	29	45
Argonne	35	25	60
Fermi	26	16	42
LANL	96	80	176
LBNL	10	28	38
ORNL	16	15	31
Pantex	8	7	15
Sandia/CA	49	26	75
Sandia/NM	196	147	343
Y-12	35	13	48
TOTAL	487	386	873

4:39, respectively. Sandia's California site finished fourth overall.

Women's division

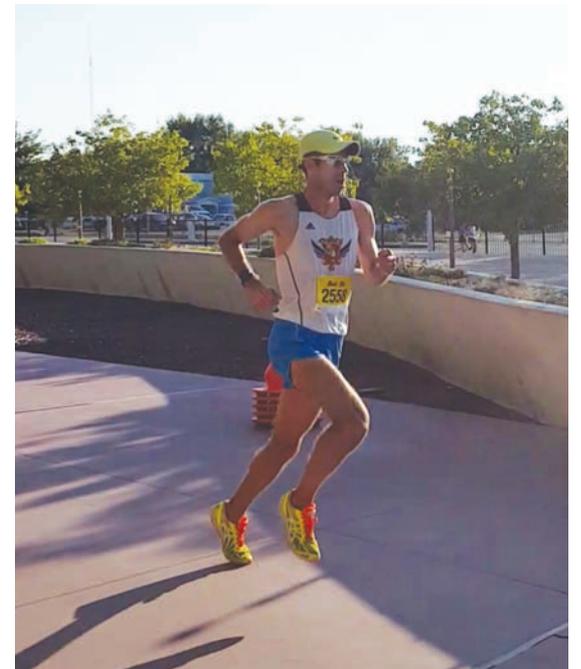
In the women's mile, Sandian Sofie Schunk came in first with a race time of 5:13.

A Division 1 soccer player for Marquette, Sofie only recently took up running and has no shortage of speed. In fact, she spent the better part of the summer trying to break a 5-minute mile and got very close, clocking 5:05 before she got burned out on training at the track.

After a two-week hiatus, Sofie ran her 5:13 Do-It-Yourself DOE Mile over a stretch on Tramway Blvd. in Albuquerque.

Landing a job at Sandia, Sofie is excited to be back in New Mexico, where she grew up. She lauds the value Sandia puts on work-life balance and replenishes herself by running on mountain trails.

"I am looking forward to running with others, especially post-COVID," Sofie said. "It is one of my



NEED FOR SPEED — Justin Wiens, the spouse of Sandian Kristin Divis, ran the fastest mile across the DOE complex, coming in at 4:21. **Photo courtesy of Kristin Divis**

favorite ways to connect with the community and network, and some of my best problem-solving and thoughts come while I'm out for a run."

Sofie's Sandia teammates were close behind, all five finishing in the top six places overall, giving them an easy team win with just 15 points.

Los Alamos National Laboratory finished in second place with 59 points and Sandia's Livermore site finished third with 81 points.

Sarah Allendorf, Sandia director of the Chemistry, Combustion, and Materials Science Center in Livermore, tried for the win in the women's mile walk, turning in a time of 13:11. "Close but no cigar," she said, as Los Alamos National Lab was a force, taking the top three places to win the team race with just 18 points. Brandy Gaffney of LANL won first place, coming in at 10:32. Lawrence Berkeley National Lab took the men's walking race with 29 points. [@](#)



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VIRTUAL CHALLENGE — Sofie Schunk ran the virtual DOE Mile race on a stretch of paved trail on Tramway Blvd. in Albuquerque, where she regularly enjoys completing her running workouts.



COMPETITIVE QUEST — 2020 DOE Mile Women's Champion Sofie Schunk competed in a cross-country running race in San Diego last year.

Photos courtesy of Sofie Schunk

LABNEWS Notes

EDITOR'S NOTE: Lab News welcomes guest columnists who wish to tell their own "Sandia story" or offer their observations on life at the Labs or on science and technology in the news. If you have a column (500-800 words) or an idea to submit, contact Lab News editor Tim Deshler at tadeshl@sandia.gov.

Remembering Paul Cooper

Sandia explosives legend leaves behind legacy of service and expertise

By **Stephanie Holinka**

Paul Cooper, one of the world's foremost explosives experts, passed away recently at the age of 83. Paul retired from Sandia in 2012, but his explosives research, seminal textbook and mentorship of future scientists lives on at the Labs and in other organizations internationally.

Outside of his field, Paul is most well-known for his work on the investigation of the 1989 USS Iowa gun turret explosion in the Atlantic Ocean, which killed 47 crewmen. The investigation and Paul's testimony before the Senate Armed Services Committee led to the Navy subsequently reopening its investigation and ultimately withdrawing accusations against a dead crew member.

As a chemical engineering graduate of the Brooklyn Polytechnic Institute, Paul joined Sandia in 1964 and worked with explosive components until 1977, when he was recruited by the Labs' Underground Nuclear Testing arming and firing group, where he worked on explosive systems design until he retired in January 1997.

In 1979, Paul joined the national Nuclear Emergency Search Team, now called the Nuclear Emergency Support Team, NNSA's team of scientists, technicians and engineers who respond to radiological accidents and incidents anywhere in the world.

In October 1991, Paul was named to a United Nations/International Atomic Energy Agency inspection team sent to Iraq to look for evidence of weapons of mass destruction following Operation Desert Storm. The investigation led to Iraq declaring officially for the first time that they had a nuclear program.

Expertise sought in investigations

Paul was part of a presidential commission that investigated ATF and FBI actions in Waco, Texas, after surviving Branch Davidians alleged the FBI started the fire. Paul's investigation supported the commission, which confirmed that the Davidians were making explosive devices and set the fire in bales of hay.

The State of Oklahoma asked Paul for investigative help in the trials of Timothy McVeigh and Terry Nichols in the April 19, 1995, bombing of the federal building in downtown Oklahoma City that killed 168 people. Paul went through files and studied photos of broken windows, overturned cars and the crater, and closely matched the amount of explosive material McVeigh and Nichols had bought in Kansas and Texas with the damage. That calculation was used in the state trial.

During the investigation of the July 1996 explosion of TWA Flight 800 over Long Island, New York, that killed all 230 people on board, Paul was part of the complex, four-year inquiry that concluded the probable cause of the accident was an explosion of fuel and air vapors in a fuel tank, most likely due to a short circuit. His calculations became part of the final report.

Teacher and storyteller

In addition to great insight and technical expertise, his former students say Paul was a natural storyteller and teacher, and taught with expertise, humor and a dash of irreverence. His classes also remained popular due to a lack of formal explosives training in the U.S. Paul taught explosives safety and technology to more than 1,000 engineers at Sandia and hundreds more at private and

government facilities nationwide.

Paul's class notes were turned into the 1996 book, *Explosives Engineering*, which remains the definitive text on explosives and is used in university and engineering programs worldwide.

"In person and through his book, Paul has taught three generations of engineers how to do explosives. His book remains the world standard textbook for how to do useful things with explosives. Before Paul's classes and book, engineers had to figure out how to do everything themselves. Paul put it in a format that made it useful for engineers," said recently retired Sandia explosives engineer Mark Grubelich.

"Paul also didn't have the ability to not work. He continued teaching both at Sandia and the military for decades after he retired from Sandia," Mark said.

Sandia explosives engineer Saul WVenner met Paul during his Sandia interview day in February 2001, and he worked with and learned from him for the next 19 years.

"Paul was an engineer's engineer and never encountered a data set he couldn't plot as a straight line. He had a remarkable ability to break down complex problems into subcomponents and define closed-form solutions that were elegant, yet tractable. These contributions to design, analysis and quantification of energetic systems largely define the term 'explosives engineering' as we know it today. He was instrumental in defining curriculums for universities offering undergraduate and graduate explosives engineering degrees in the U.S. His texts are go-to resources



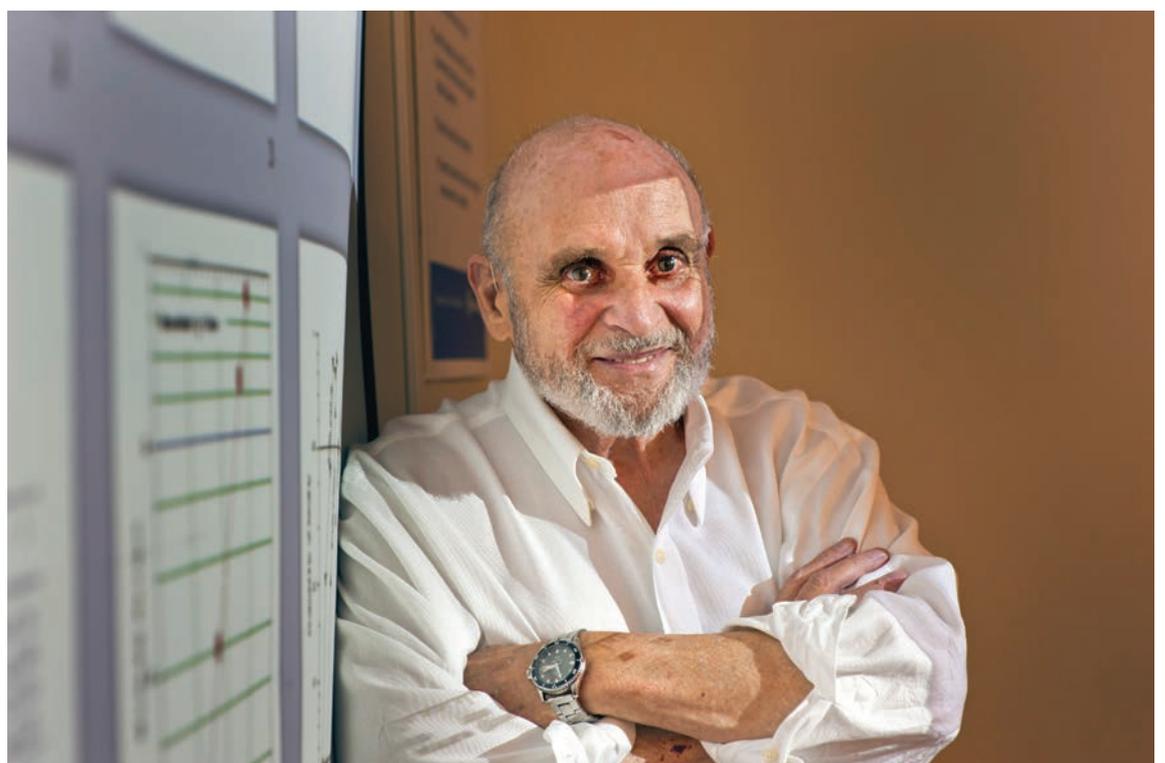
IGNITION TEST — In a 1990 Lab News photo taken during the USS Iowa investigation, explosive engineer Paul Cooper explains the half-scale test apparatus used for impact-ignition experiments. **Photo courtesy of Lab News archives**

for students, practicing engineers and even special effects designers," Saul said.

"Paul's ability to understand the optimal balance of detail and intuition is what has made him the best engineer I have ever encountered," said Sandia explosives engineer Jerry Stoffeth. "His ability to understand the balance between seriousness and humor, between work and play, between associates and friends, is what has made him one of the best people I have ever encountered.

"When he retired, he asked me to host his party. His one request was that I didn't allow any discussion of engineering or work at Sandia at all. He wanted a roast — he wanted people to tell jokes and make fun of him, and each other," Jerry said.

In a [Lab News interview from 2015](#), Paul described his career with his characteristic grace and humility. "Along the way, wonderful things happened," he said. "I was just in the right place at the right time." [f](#)



WORLD CLASS — Paul Cooper built a global reputation as an explosives expert and passed his knowledge to more than 1,000 engineers at Sandia and worldwide in courses he taught for more than 35 years, and via his book, which remains the standard for explosives engineers. **Photo by Randy Montoya**

Women @ Energy features Sandra Begay

Sandia systems engineer recognized by DOE STEM Rising site

By **Sarah Jewel Johnson**

Sandia systems engineer Sandra Begay has been recognized by DOE's **Women @ Energy: STEM Rising** website, which honors women in STEM fields throughout the DOE complex.

Sandra Begay is the daughter of a Navajo tribal leader and a public health nurse. She is a proud member of the Navajo Nation, and recently received the American Indian Science and Engineering Society's **2020 Indigenous Excellence Award** in recognition of her outstanding work to expand opportunities for Indigenous students and professionals in STEM education and careers. She has been at Sandia for more than 28 years.

Sandra grew up in Gallup, New Mexico, and spent weekends on the Navajo Reservation with her father for his tribal government meetings. It was on the reservation that the beautiful, natural vistas inspired Sandra to "look into the distance to see what is possible."

Sandra represents the seven out of 100 American Indian and Alaska Native youth who will obtain a college degree — a statistic and humbling honor she does not take lightly. "It's important to me that people know where I started, and that they know the family I come from," she said. "I am honored for the opportunity to contribute technical support to indigenous people and tribes across the country."

Sandra's passion for sharing STEM with native students and women across New Mexico is apparent in her many personal, professional and academic ventures. In 2002, she created a mentorship program for American Indian interns through Sandia's Department of Indian Energy Program and was an active mentor in the program through 2018.

In 2006, she was featured in a chapter of the American Society of Civil Engineers book *Changing Our World: True Stories of Women Engineers*. The chapter highlighted Sandra's work providing hundreds of solar panels for Navajo families in New Mexico. In 2009, Sandra was awarded the American Indian Science and Engineering Society's **Ely S. Parker Lifetime Achievement Award**, and in 2019, she took a leave of absence to work for Mayor Tim Keller as the City of Albuquerque's environmental health director.

Sandra earned her bachelor's degree in civil engineering from the University of New Mexico and her master's degree in structural engineering, with an emphasis in earthquake engineering, from Stanford University. She has worked at leading research and development laboratories, including Sandia, Lawrence Livermore National Laboratory and Los Alamos National Laboratory.

Sandra was interviewed recently for her feature spot on the DOE Women @ Energy website.

Q Describe your current role at Sandia. What is the main purpose and mission of your work?

Right now, I am a research and development systems engineer, with a focus in mechanical engineering. I am really working to find a place to do good work, which means I get to be involved in many different projects at once. I am currently working on a **Laboratory Directed Research and Development** initiative with the mission campaign resilient energy systems testbed and an update to Sandia's Environment, Safety and Health manual, and I'm involved in a DOE benchmarking activity for ES&H best practices. I also work with the Office of Indian Energy when they need technical assistance on various projects. It's a lot of different things right now because I returned from a leave of absence in January 2020 after working as the City of Albuquerque's environmental health director.

The main purpose of all my work, both inside and outside of Sandia, is helping people solve problems. Even my name, Sandra, means "helper."

I've known since I was little that I've always wanted to help. I take the skills I learned in school, beyond just my credentials, and I get to work on wonderful technical challenges. At Sandia, all my jobs have been in service to help others — not necessarily to build a gadget — but to build a process

or something to help people. So much of my work relates to identifying issues and finding cost and materials to solve the issue.

I was involved in strategic planning for the 20-year horizon for Sandia to meet DOE's goals and for Sandia's then prime contractor, Lockheed Martin's, goals. Now I work with renewable energy to help develop ideas to achieve a cleaner energy future. At the same time, I look for ways technology can help Navajo families have energy in their home, miles from the grid. That's who I am, I'm a helper, but I use science and engineering to get to answers.

Q What inspired you to work in STEM?

In fourth grade, I lived in a boarding school outside of my hometown, and my sister and I got to go home on weekends. We had to get up early to shower and get ready for the day, and then we had to march from our dorm to the dining hall for breakfast. We marched in the cold and wind. I first thought during one of these marches, "This is a problem, there has to be a solution."

I thought to myself, "Why can't we just put in a monorail?" I did not like walking in the harsh weather conditions, so I tried to solve the problem. Of course, as a fourth grader, I didn't think of cost or realistic options but seeing a challenge rather than just focusing on the negativity of the situation was a huge step in my thinking. I immediately thought about what I could do to solve the issue.

In sixth grade, my teacher gave the class two-dimensional drawing assignments. I was always great at drawing a straight line, and I enjoyed doing renderings of buildings. One day, he told me that I could have a career using the same skills required to draw a two-dimensional drawing. I said I would like to be an architect, but I didn't think I had the artistic ability to do that — I wasn't creative enough — but I could draw a straight line.

He explained that I could be an engineer because engineers work to design blueprints based on the architect's drawings. The seed was planted, and I knew I was going to be an engineer. Of course, it was certainly a rocky path to get from sixth grade to my engineering degree.

Q What excites you about your work at the Energy Department?

From the technical viewpoint, I think what really excites me is that we are looking to solve problems for the future. There are harsh realities that keep us grounded as we seek to better the future, but I'm ready to take on the challenge.

It's always challenging when people ask what I do. I say that I am trying to save the planet because that's truly what I really feel my role is. That's how exciting energy work can be! We have answers to solve so many of the world's problems, but we need to gain momentum. Green energy and renewable energy are so exciting because we can have a cleaner energy future.

From the people side, I enjoy trying to teach others what I've learned during my career. Mentoring and coaching students and young interns is my passion and such an honor.

Q How can our country engage more women, girls, and other underrepresented groups in STEM?

I think young women and underrepresented groups have been able to see what an engineer does for their day-to-day work. You can describe it in words, but if you can show it, they can really grasp what it means to be an engineer.

PBS filmed a video highlighting my work on solar units on the Navajo Nation, and this video became a tangible way to show what my work can do. It really takes exposure to the work, maybe visiting a site where an engineer works, to solve problems so the women, girls and underrepresented groups can see what the job is all about.

I also know it takes a large amount of encouragement from teachers and community for a STEM career. I think math is still a hindrance for many young women, so reminding girls that it's okay to ask for help is another way to encourage them to break



PROBLEM SOLVER — Sandia systems engineer Sandra Begay examines a solar panel during a visit to Window Rock, Arizona. Window Rock is the seat of government of the Navajo Nation. **Photo by Randy Montoya**

into engineering. Over the course of my academics, I had many tutors and I often struggled to ask questions. Now I try to remind girls that asking more questions is a good thing — that we can all learn when someone asks a question, that it's not a sign of weakness.

Minority women in STEM have to understand the numbers and not be naïve. We will always be a minority, but being a minority may give us unique perspectives. It also may give us unique opportunities to do very interesting work.

When people ask me what it's like to be a female Navajo engineer, I tell them that it feels like sitting at the bottom of the "Pit" (University of New Mexico basketball arena). The whole place is filled with 13,000 engineers, and you are the only American Indian female engineer in the whole place. That's the context of how I fit into the STEM world. I am the one Native and female engineer out of those 13,000 engineers, but I am always grateful for the honors I receive, and I get to be a part of some cool and interesting assignments. I love my work and the chance to represent others like myself in the STEM workforce.

Q Do you have tips for someone looking to enter your field of work?

I think when you have your academic credentials, that's the first step. But when you get into the workforce, young engineers have to know that you really have to work hard for the first five years to build your credibility and work ethic, regardless of what field you are in. You have to prove to others that you have capabilities and that you are a hard worker, and that takes time. You have to be deliberate to prove that you are there to make a difference through your work.

Part of being deliberate is learning how to present your work. You can't just write reports — you have to learn to talk about your work and present it in a professional way. For example, performance management requires me to write about my work and then present it to my boss. But that's not enough. I then will be compared to other engineers in other departments, so I have to learn to talk about my work with other managers and staff outside of my department. Talking about your work is not always a natural thing — it certainly is not for me. But when I'm excited about a project, it's really easy to do, and I've had to learn these presentation skills over time.

I also feel it is important to learn from every job you have. Just because a job is not ideal does not mean that you cannot learn and grow from it. The job may be short-term or something you don't like, but you can work on ways to improve the role and use those lessons to step into another role that you may love. Always learn from what you do day to day.

Q When you have free time, what are your hobbies?

I love to go to the movies. I love science fiction movies because I enjoy the fantasy and story line. It's my way of relaxing and diving into the stories on the screen. I used to be a big fan of X-Files, and there was an episode where Fox Mulder, a detective for the FBI, solves a global problem by going to Navajo medicine men. The Navajo medicine men help saved the world! I just love that sci-fi can take a world problem and combine modern technology with medicine men to solve the issue.

I also love to cook and I'm a fan of the Food Network. So many dishes to try cooking and eat what was created! 🍳

Sandia hosts Education With Industry officer

Air Force captain brings experience and determination to Labs

By **Michael J. Baker**

With the resiliency and determination that earned her the U.S. Air Force call sign “Fenix,” Capt. Justine Wolff is using her position as an Education With Industry student at Sandia to better herself and the Air Force.

“How great of an opportunity this is to understand our lab partners,” she said. “It’s good to get the word out to get high-quality officers here to learn and take that knowledge back. There is so much I’m learning here that’s just improving my career and will serve the Air Force.”

Justine is the second Air Force fellow paired with Sandia in the **Education With Industry** program, which matches participants with commercial company leaders in their career field. Justine is the Air Force’s second 21M munitions and missile maintenance officer to be selected for the program — both have been hosted by Sandia’s Military Liaison group.

“Sandia is an excellent company for a munitions and missile maintenance professional to partner with,” Justine said. “I look forward to expanding my aperture on both strategic relationships in the nuclear deterrence arena and understanding how Sandia contributes to global and national security.”

Hands-on experience aids USAF missions

With more than 11 years in the Air Force and having worked on three continents, Justine brings a wealth of experience to Sandia. During her first weeks at Sandia, she assisted with facilitating and training students from all over the U.S. nuclear enterprise and took the lead to conduct nuclear stockpile orientation training for the new commander of the Air Force Nuclear Weapon Center at Kirtland Air Force Base.

“Our goal is to immerse Justine in Sandia nuclear weapon mission areas, such as U.S. nuclear stockpile sustainment and surveillance and annual assessment, as well as research and development for life extension programs here and at other locations, such as Pantex and Kansas City National Security Campus,” said systems engineer Mark Meyer with Sandia’s Military Liaison group.

“We are extremely impressed with Capt. Wolff and want to give her a hearty welcome to the Sandia and Kirtland team,” Mark said. “When she returns to the USAF after 10 months, Justine will have gained a much clearer understanding of how her military requirements for safe, secure and reliable nuclear weapon systems, test gear, handling gear and joint technical publications support our nation’s nuclear triad.”



RISING FENIX — Standing next to the Terrier Missile display at the National Museum of Nuclear Science & History, U.S. Air Force Capt. Justine Wolff, known by the call sign of “Fenix,” is Sandia’s second Education With Industry student.

Photo by **Randy Montoya**

As a 21M munitions and missile maintenance officer, she will use this Education With Industry experience to enhance mission readiness and combat capability for the land-based intercontinental ballistic missiles and air delivered systems, which are two-thirds of the U.S. nuclear triad deterrent mission, Mark said.

Munitions and missile maintenance officers are responsible for formulating and implementing maintenance procedures that ensure Air Force weapons capabilities are well-maintained, accounted for and logistically available to the warfighter both stateside and abroad.

Experience, fortitude to be called ‘Fenix’

Justine has had assignments in Japan, Germany and most recently, Northern California. Her last assignment before joining Sandia was as the Operations Officer, 9th Munitions Squadron at Beale Air Force Base in California. She was second in command of the Air Force Combat Ammunition Center’s Planning and Production Course and Air Force Senior Officer Munitions Course, providing more than 70,000 hours of academic instruction annually. She also was involved in the development of Air Force Munitions Doctrine, as well as tactics, techniques and procedures for combat munitions production directly influencing overseas contingency operations.

It was at an advanced sortie production training course at Nellis Air Force Base near Las Vegas earlier this year that Justine earned the call sign “Fenix,” an alternative spelling for phoenix, the mythological bird that arises from ashes to regenerate. Justine was a distinguished graduate of the training course.

She embraces the call sign Fenix, calling it her “spirit animal” and adding, “No matter what life demands, I’ll awaken, rise above and recreate.”

Justine, who grew up in Syracuse, New York, enlisted in the Air Force in 2008 as a logistics planner and deployed to Afghanistan in support of Operation Enduring Freedom. She received a scholarship for Outstanding Airman to the Reserve Officer Training Corp. She received her Air Force commission in 2013 from California State University, Sacramento, and was a distinguished graduate with a Bachelor of Arts degree.

Understanding industry best practices

Education With Industry is administered by the Air Force Institute of Technology on behalf of the Secretary of the Air Force, Acquisition. The program sends Air Force officers and enlisted personnel on a 10-month career-broadening tour with a selected company to observe and learn cutting-edge technology and innovative management processes. The program started in 1947, the same year the Air Force was established. Sandia joined the program last year.

In this 73rd Education With Industry class, 45 companies — including Amazon, Delta Air Lines Inc. and UPS Inc. — will support 76 Air Force fellows selected by a personnel board in a competitive process. The program’s stated intent is to broaden and expose selected personnel to the commercial logistics, system design, engineering and industrial maintenance experience. Graduates return to the Air Force and provide first-hand knowledge of how leading firms accomplish best practices to help establish more effective and efficient processes within the Air Force.

Sandia employees wishing to help with Justine’s training can locate her through the Labs’ employee directory. [f](#)

B61-12 flight test

CONTINUED FROM PAGE 1

“The success of this test, as with all other weapons evaluations, is only possible through the detailed planning, combined with full collaboration between TTR and the program engineers, and the execution of the test evolution by the field operators and recovery specialists in the combined team of Sandia and TTR’s operations and maintenance subcontractor, Navarro Research and Engineering,” he said. “With the multiple phases and operational activities a test involves, the team at TTR is diligent to integrate safety and security into all segments to ensure proper precautions are implemented for mission success.”

Coordination between Sandia, Los Alamos, NNSA and the Air Force made the flight test possible, and initial data shows that all systems and interfaces between the refurbished bomb and the F-35A worked as expected.

Unlike previous fighter jets, the F-35A carries the bomb internally. The recent flight test was the first demonstration of a fully instrumented B61-12

release from an internal bomb bay on a fighter and the first such release at speeds of Mach 1 or greater, Steven said.

“This was the first test to exercise all systems, including mechanical, electrical, communication and release between the B61-12 and the F-35A,” he said.

The test also came amid now commonplace COVID-19 workplace restrictions, which can make planning more difficult but are not slowing down Sandia’s important mission work, said B61-12 program senior manager Christine Mitchell. “Sandia National Labs, Los Alamos National Laboratory, NNSA and our Air Force partners are working diligently to ensure F-35A major milestones stay on track, despite the challenges presented by COVID-19.”

The F-35A is a fifth-generation fighter and is described by an **Air Force fact sheet** as an “agile, versatile, high-performance, 9-G capable multi-role fighter” with stealth technology and advanced sensors. Nine countries — the United States, United Kingdom, Italy, Netherlands, Turkey, Canada, Denmark, Norway and Australia — were

involved in the fighter jet’s development.

“The latest test is a critical piece in the F-35A and B61-12 program,” Steven said. “Aboard the newest fighter, the B61-12 provides a strong piece of the overall nuclear deterrence strategy for our country and our allies.”

Labs design, engineering play key role

The compatibility testing is an essential part of the **B61-12 Life Extension Program** to refurbish, reuse or replace components, extend the bomb’s service life, and improve its safety, security and effectiveness.

A life extension program allows scientists and engineers to address the aging of nuclear weapons components. Some components are requalified and go back into a weapon without change; others that have aged are remanufactured using the original specifications; and sometimes the original technology is no longer available, so Sandia redesigns those parts using modern technology. [f](#)

CLICK HERE
WATCH THE B61-12 FLIGHT TEST VIDEO

Sandia secures six regional technology transfer awards

By **Manette Newbold Fisher**

For responding with innovative solutions during the pandemic, developing solar cell and hydrogen research technology and creatively working with companies, Sandia won six prestigious regional 2020 **Federal Laboratory Consortium** awards.

The awards for the Mid-Continent and Far West regions put a spotlight on Sandia successes in transferring technology, partnerships and licensing. In addition, Sandia was honored with the Regional Laboratory Award for rapidly responding to COVID-19 challenges in order to help mitigate threats to the U.S. and its economy.

“During this unprecedented year, Sandia was able to demonstrate our continued commitment to developing innovative technology and partnerships that help secure our nation’s future,” said Mary Monson, senior manager of technology partnerships and business development at Sandia. “While some of the awards recognized years-long partnerships and progress, Sandia was also recognized for our ability to step up in a time of crisis to deploy licenses quickly during the pandemic, and work with companies on COVID-19 projects. We are very proud of the work we do at the Labs, and we are pleased the consortium celebrated our efforts.”

The consortium recognized Sandia for:

- Developing a new Rapid Technology Deployment Program for licensing Sandia intellectual property and assisting companies working on COVID-19 projects through the New Mexico Small Business Assistance program.
- A continued partnership with the University of Puerto Rico, Mayagüez, which continues to focus on bringing more reliable electricity to remote communities.
- Deploying technologies developed at Sandia to companies with the guidance and creativity of licensing expert Bob Westervelt.
- Transferring technology to BayoTech, a New Mexico company that envisions local production of hydrogen as a way to reduce the costs and help the country transition to hydrogen fuels, which are better for the environment.
- Transferring small solar cell research to mPower, a New Mexico company that continues to advance the technology for use in homes, everyday objects, and most recently a small satellite.
- Developing a technology called ducted fuel injection that could reduce soot emissions coming from diesel engines.

The Federal Laboratory Consortium is a network of more than 300 federal laboratories, agencies and research centers. The awards are ranked as some of the most respected honors for federal laboratories and partners that demonstrate outstanding technology-transfer achievements.

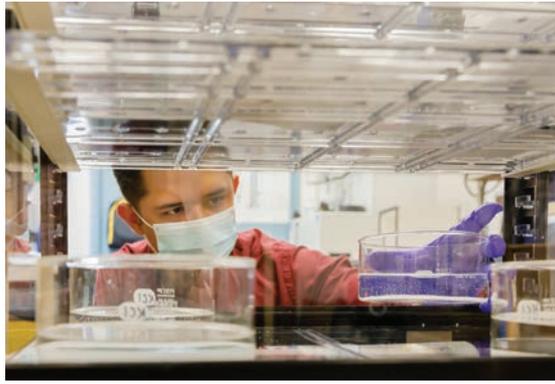
Addressing COVID-19 challenges

When the country faced the COVID-19 pandemic, Sandia created solutions to help companies through licenses and projects, Mary said. For these efforts, the consortium awarded Sandia with the Regional Laboratory Award.

Right after a national emergency due to the COVID-19 pandemic was declared on March 13, a new employee came up with an idea for the **Rapid Technology Deployment Program**, which made Sandia patents freely available to U.S. companies through a speedy process. The program opened about 75% of Sandia’s intellectual property portfolio, and free licenses can be issued in two days.

“Other national laboratories have since adopted Sandia’s program, and licenses continue to be available,” Mary said. “There have already been 14 licenses, including 29 patents, signed in the months since the program began.”

The **New Mexico Small Business Assistance** program also rapidly mobilized to provide assistance to companies with COVID-19-related product development challenges, and the projects were fast-tracked through the system.



MATERIAL SUPPORT — Sandia Principal Investigator Michael Omana tested materials for Albuquerque companies looking to manufacture N95-like respirators.

Photo by Bret Latter

Researchers helped a **Santa Fe distillery test hand sanitizer** when the product was in short supply in stores everywhere.

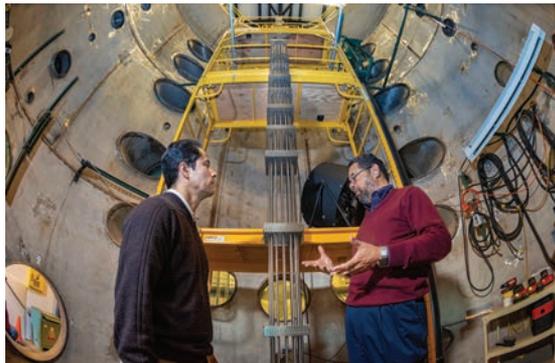
Sandia also helped Albuquerque medical device manufacturers test materials used in **N95-like respirators**, and another team worked on ways to extend the shelf life of a vaccine candidate that would provide benefits to parts of the world where refrigeration is not always available.

“Our researchers really stepped up to address challenges in a critical time of need,” Mary said.

Long partnership, new agreements

Sandia received a Partnership Award for its **collaborative research** with the University of Puerto Rico, Mayagüez, over the past two decades. In 2016, collaboration was strengthened with the establishment of a **summer internship program**, and subsequently, a faculty fellowship program that the university participates in. Late last year, Sandia and the university signed a **Cooperative Research and Development Agreement**. The partnership’s focus has been on developing safe, secure energy and environment projects for resiliency and reliability.

Specific areas of collaboration include re-electricification of remote communities and development of next generation microgrids for rural and vulnerable communities. An additional research focus will examine the lifecycle of energy components and systems from production to use and final disposition.



ENERGY CONNECTION — In this photo, taken prior to the COVID-19 national emergency declaration, University of Puerto Rico, Mayagüez, electrical engineering professor Efrain O’Neill, left, talks energy research with Sandia senior manager Tito Bonano.

Photo by Randy Montoya

Creativity in licensing process

The consortium honored Bob Westervelt, a Sandia licensing expert, with the Outstanding Technology Transfer Professional Award. Bob brought unique experience to the Labs, as he has been on both sides of licensing, Mary said. With a doctorate in nuclear physics and experience in the private sector, his skills are ideal for understanding the value of intellectual property and negotiating complex licenses.

Bob develops creative licensing solutions that have led to a license focused on enabling technology for **medical isotopes**, a licensing plan for New Mexico company BayoTech to sell on-site hydrogen production units, and a license to allow companies to provide training for free emergency response software. He also has developed licensing templates used for Sandia’s technology transfer program and trained staff on best practices. A Sandia concept called High Value Licensing can be attributed to Bob; it helps staff analyze and articulate the value of licensing efforts.

“Value is not only measured as income,” Bob said. “Benefits to the public and the U.S. economy are also important.”



SOLAR SUCCESS — Former Sandia scientist Murat Okandan shows a prototype of small, lightweight flexible solar cells developed at the Labs. Okandan left Sandia and licensed the technology when he started mPower, which manufactures the technology as DragonSCALES.

Photo by Randy Montoya

Hydrogen generation technology

Sandia received an Excellence in Technology Transfer Award due to the success of licensing high-efficiency hydrogen generation technology to BayoTech, a New Mexico company that developed a solution for on-site production of low-cost, low-carbon hydrogen.

BayoTech’s modular, scalable and rapidly deployable generators produce hydrogen at the point of use, eliminating the cost and carbon emissions associated with liquification and transportation.

“Hydrogen will be a key enabler for the global energy transition,” said BayoTech Director of Research and Development Robert Moore.

“BayoTech’s high-efficiency hydrogen generation technology provides a consistent, cost-effective supply of low-carbon hydrogen that can power zero-emission transportation, decarbonize industry and accelerate the transition to a clean-energy future.”

DragonSCALES moves to space sector

Sandia received an Excellence in Technology Transfer Award for developing microsystems-enabled photovoltaics, a technology that was **transferred to mPower**. The invention uses micro design and microfabrication to make miniature solar cells.

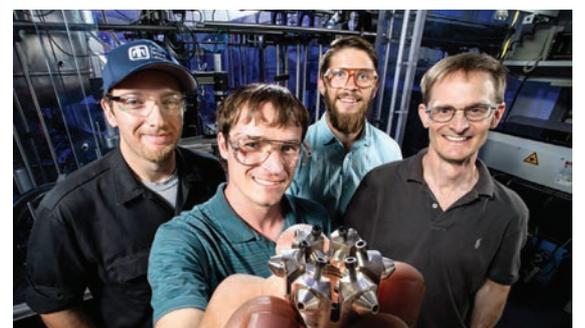
Former Sandia scientist Murat Okandan left the Labs to start mPower and licensed the technology to commercialize it as DragonSCALES, now being manufactured for national security and energy applications. Its small size reduces material costs while enhancing cell performance, potentially in buildings, homes, clothing, portable electronics, vehicles and more.

The company is currently engaged in the space solar power market. According to Okandan, DragonSCALES has been integrated on a small satellite for an in-orbit demonstration scheduled to launch in December.

Reducing diesel engine emissions

Sandia won an Outstanding Technology Development Award for its work on **ducted fuel injection**, a patented technology that slashes emissions of soot and nitrogen oxides from diesel engines by about 80% and is synergistic with sustainable liquid fuels like biodiesel.

According to Chuck Mueller, who leads the project, ducted fuel injection is a simple, mechanical solution that involves installing tubes inside a diesel engine’s combustion chamber. Passing each fuel spray through a tube enhances entrainment and mixing, leading to lower soot production than when fuel is sprayed unconfined into a chamber. The lower soot levels enable the use of an existing, cost-effective approach to simultaneously attenuate emissions of nitrogen oxides. 



KICKING EMISSIONS — Sandia researchers, from left, Nathan Harry, Christopher Nilsen, Drummond Biles and Charles Mueller show off a prototype ducted fuel injection module.

Photo by Randy Wong

Overcoming COVID fatigue

Stay focused and creative in the midst of the pandemic

By **Tamara Cagney**,
Licensed mental health counselor

Sandians are proving to be adaptable and flexible as they pivot in response to near-daily changes. After more than eight months of isolating, social distancing, being careful and being scared, there is a new name for what we all are experiencing — COVID fatigue.

The continuing pandemic has led to a double challenge: ongoing daily stress from virus-caused disruption and prolonged uncertainty about how long it will last.

How we choose to react will impact our personal health, our mission at Sandia and the timing of the virus's eventual defeat.

Prolonged attack on cognitive resources

Unfortunately, there are no easy solutions. As cases continue to rise sharply throughout the nation, COVID fatigue may lead some people toward carelessness. Even so, we can still help ourselves, our families and others.

Knowing why we feel like everything is abnormal can help us feel normal. As the continued difficulties and ongoing stress of being in a pandemic build, it's easy to lose optimism and start having negative — or even angry — reactions.

Any period of uncertainty, challenge or crisis can overload the human brain. Even in the best of times, our workplaces and homes are filled with stressors that can push our emotional buttons and exhaust our cognitive abilities. These stressors are interpreted by our brains as threats.

When combined with a period of prolonged crisis, these threats can be overwhelming, both emotionally and physically. A large part of our cognitive capacities is required to monitor and manage the perceived threats. Having our awareness and threat levels on constant mid-alert — even when we're seemingly at rest — significantly impairs our capacity for everything else. And maintaining that mid-alert level presents a fatiguing challenge with a cumulative impact over time.

So, what can we do to better manage our cognitive resources and stay focused and productive? Here are seven brain-friendly approaches that might help.

1. Respect your new cognitive-capacity baseline

We can only do so much. Our brains can only do so much, and the limits of our "thinking brains" are more pronounced in times like this.

Have you recalibrated your workload to account for these limits? Have you done the same for your team? Have you adjusted your expectations at home, especially if your children are experiencing distance learning?

Be radically realistic. Take a fresh look at what you're asking yourself and those around you to do and by when. Relax these demands wherever you can.

2. Know your limits and don't limit your noes

You've recalibrated your workload and priorities to better suit your current cognitive capacities. Now promote certainty and choices by pushing a few brain-based "hot buttons" to achieve a positive state that will make it easier to focus.

Create and maintain a daily routine to give a sense of normalcy within the chaos. Setting boundaries in periods of uncertainty is critical. Acknowledge opportunities to make choices throughout the day (and give plenty of choices to those around you) to increase your sense of autonomy while dampening your feelings of losing control.

Give yourself permission to say no, perhaps in different areas than you would have, pre-COVID. Everyone is dealing with limited resources and reserves. Conserve yours by practicing self-care and keeping it simple where you can.



COGNITIVE OVERLOAD — After more than eight months of isolation and frequent disruptions to daily routines, many people are experiencing COVID fatigue, but Sandians are finding ways to adapt and continue their critical national security work.

Photo by Randy Montoya

3. Tackle shorter periods of concentrated work

For adults, the sweet spot for a period of uninterrupted work is between 60 and 75 minutes — enough time to descend into a project, but short enough to avoid taxing your brain. Yet that might be too long for our current climate. Many people find 20 minutes on and five minutes off to be a better rhythm these days.

Our brains need regular breaks — more so when the pressure is on — and those breaks need to be actual downtime, so schedule in more breaks, and make meetings shorter. And be sure to take real breaks. Don't check email or surf social media; instead, stretch, breathe, walk or take time for quiet reflection and rejuvenation.

4. Set nearer-term goals

During any period of uncertainty and volatility, a long-term vision can be extremely helpful if you shorten the planning and execution horizons. Apply this principle at the organizational and strategic levels, as well as in your daily habits and practices at work and home.

Resist the temptation to plan too far out. Instead, make near-term goals with plenty of regular reviews and opportunities to learn and course correct. A flexible pilot-and-pivot approach is more helpful these days.

5. Make optimization the new watchword

When circumstances become challenging, we tend to fall back on some common behaviors:

- Speeding up, to the point of losing perspective.
- Adding way too many things to our task lists; just looking at the lists is overwhelming.
- Responding to every instant message and email as they arrive to show you are on the job.
- Scheduling too many meetings and letting them run too long. The wrong people are present, the right people are absent, and meeting prep is incomplete.

Challenge every one of these unhelpful behaviors with a thought for optimization. Consciously slow yourself down throughout the day. Schedule blocks of time for work followed by short periods for replying to messages and emails, rather than letting them be constant interruptions. Have single-item task lists at any given moment. And practice a whole new level of meeting discipline.

6. Be creative, especially during the holidays

Take advantage of the disruption and be creative. Do things differently than in the past. The

upcoming holidays are a good opportunity to use your imagination and ingenuity.

A big part of COVID fatigue is tied to the lack of control we feel when we realize we don't know how long this situation will continue. If you find yourself wanting to go out, visit family, eat at restaurants or travel again — especially during the upcoming holidays — remember there really is only one way each of us can make that happen: by staying safe and following health guidelines.

The coronavirus doesn't care about holidays, and unfortunately, COVID-19 is on the rise across the nation. Now is not the time to let down our guard and say it's the holiday — let's be merry. While not explicitly telling people to cancel their holiday plans, scientists are urging people to think of alternative ways to celebrate and are encouraging a kind of rationing of togetherness.

Unfortunately, just like everything else, there are no easy answers. Public health officials doubt that an elegant way exists to finesse the 2020 pandemic-shrouded holidays with minimal disruption, for example, by working through a checklist of best practices that include timely testing, scrupulous social distancing and disciplined mask-wearing. Instead, people will need to make serious adjustments as they calculate the risks and rewards of holiday gatherings.

Give yourself permission to be creative as you think about how to celebrate the holidays differently this year while protecting your older and more vulnerable family members. You may have to say no to invitations to travel and gather with friends and family, unless these gatherings take place online.

7. Be part of the solution

The emotional energy we bring to every conversation, meeting and exchange has a profound impact on the brains (and hearts) around us.

Whenever you're under pressure, ask yourself: Am I helping? Or am I making things more complicated?

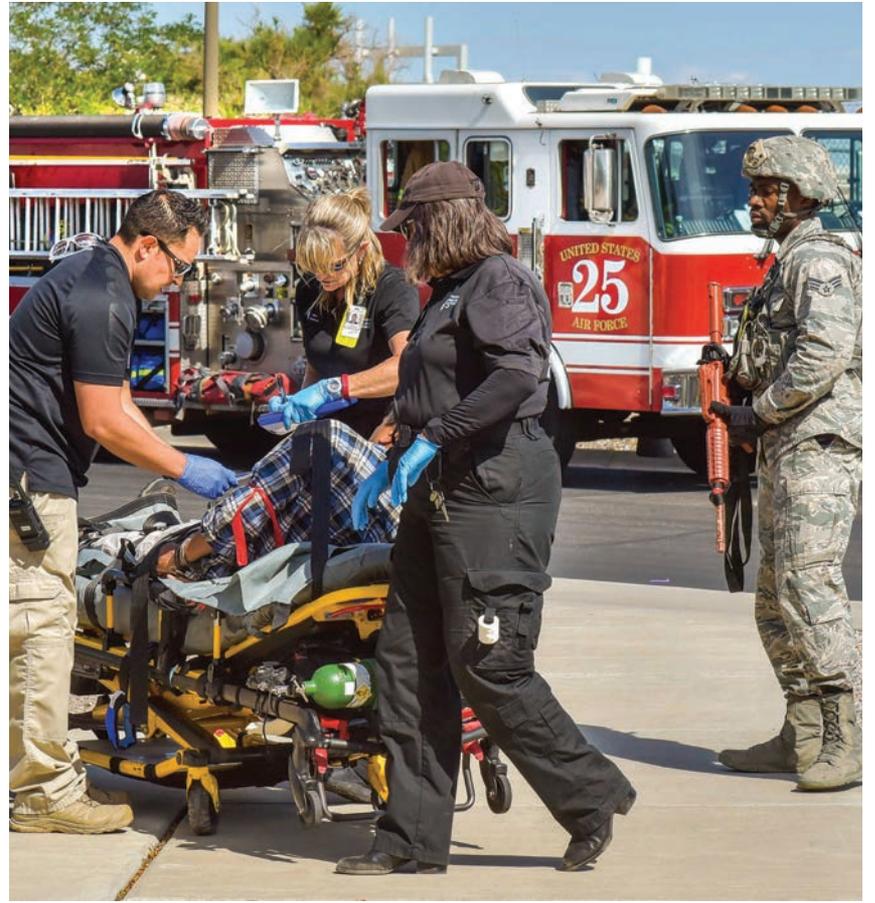
Consider whether you are leading by example when it comes to being flexible, focused and productive. Are you demonstrating an adaptive mindset to deal with the current challenge? Are you using your imagination, creativity and ingenuity? Are you remembering that everyone is under pressure and practicing patience?

If not, what small shifts could you make at work and at home to do things differently in these different times? 

Renewed base support agreement sharpens Sandia's emergency management focus



WATER WORKS — Kirtland Fire Emergency Services responds to a brush fire on Sandia property.



PRACTICE RUN — Sandia emergency responders conduct an emergency exercise with Kirtland Fire Emergency Services. **Photos by Randy Montoya**

By **Luke Frank**

Sandia's emergency management program has seen some changes this year, first with a move to **Environment, Safety & Health**, and then embracing a broader strategic vision to a comprehensive emergency management system.

Through that lens, the Labs more recently seized an opportunity to elevate its **emergency management program** as NNSA's base support agreement with Kirtland Air Force Base came up for renewal.

"Historically, Sandia has focused its resources and efforts heavily on emergency response, a vital component of emergency management, to be sure," said David Stuhan, Sandia's new emergency management senior manager. "Under the new base support agreement, we have shifted key emergency response capabilities, like incident command, hazardous materials, technical rescue and others, to Kirtland Fire Emergency Services 24 hours a day, seven days a week. This move enables us to reinvest resources to strengthen our overall emergency management program."

This isn't entirely new. KFES has long provided technical rescue, hazardous materials, fire and emergency medical services for Sandia after business hours and on weekends. By eliminating this duplication of services and bringing in KFES response full time, Sandia will reapply resources through a strategic approach to improve the Labs' overall emergency preparedness, response, recovery and mitigation across the site.

Sandia emergency planner Deborah Espinosa, who is leading the transition, said that although outwardly not much is changing for the average Sandia employee, on Nov. 12, Kirtland Fire Emergency Services became the primary field emergency responders and will now serve in an incident command role for all emergencies at the Labs. Sandia will remain a critical part of the incident command system and also will add personnel to its Emergency Management Communications Center to make key, time-sensitive, emergency management decisions 24 hours a day.

"We'll still have rapid, on-site emergency response by highly qualified professionals, but we will be able to reinvest some of our emergency response resources into other components of our emergency management program," said David, who came to Sandia in September from Los Alamos National Laboratory, where he led its emergency management division.

Although KFES will assume emergency response duties immediately, response services will transition gradually and methodically to allow KFES personnel to get familiar with Sandia's vital mission work, singular operations and unique hazards. "We will take our time in ensuring KFES has the knowledge, relationships and keen understanding of our facilities," said Shawn Howry, team lead for Sandia's emergency readiness program.

This longer-term transition will include facility walkthroughs and targeted presentations to higher-risk areas at the Labs, along with integrated drills and exercises that will guide Sandia and KFES to better build and evaluate teams, functions, duties and procedures during an incident.

"We understand that Sandia brings a unique mission, and the potential for it changing from day to day is there," said KFES Chief Jaime Jimenez. "But Kirtland Fire Emergency Services capabilities include what you would see in any city. We cover structural firefighting, hazardous-materials and confined-space responses, high-angle rescue and emergency medical services, with both emergency medical technicians and paramedics."

Managing Sandia emergencies

After months of strategic planning by Sandia emergency management personnel, this new emergency management vision is coming into focus to improve Sandia's overall level of preparedness to ensure that workers know exactly how to respond during an incident.

The Labs will be involving Sandia employees more in emergency management, so they are more knowledgeable and better prepared to ensure their safety and the safety of their colleagues.

"We can better focus now on immediate responses within a facility to protect workers and their critical infrastructure," David said. "Improved preparedness across Sandia will provide all members of the workforce with swift protective actions to take during an emergency, before emergency responders arrive. We'll sharpen our focus on facility-level preparedness."

During this period, Sandia will provide agency representatives to an incident command post in the event of an emergency. "These are our folks who know our facilities, mission-critical operations and distinct hazards and will support KFES incident commanders in making decisions about a rescue response," David said. "We're also investing in duty officers within our Emergency Management Communications Center who will

be available 24 hours a day, seven days a week, to assist in making key emergency management decisions in Sandia's interests."

Another area of focus in building out the Labs' comprehensive emergency management system will be expanding and solidifying Sandia's partnerships and collaborations with critical local and state emergency management agencies and homeland security agencies, along with DOE headquarters.

"These are important support entities during a large-scale incident that can quickly marshal resources, ideas and experiences in the throes of an event, whether at Sandia, on Kirtland Air Force Base, in the community or at the national level," David said. "Emergency management professionals and first responders are part of an extraordinary community devoted to supporting one another in times of need."

Familiar look, new focus

Effective emergency management programs use a proven, sound architecture and strong foundation, upon which a program is built. The underpinnings of such a comprehensive emergency management system are based on a Federal Emergency Management Agency National Incident Management System developed in the late '80s and proven effective through cataclysmic events from the World Trade Center attack to Hurricane Katrina.

Consistent with this model, Sandia will continue staffing and managing its Emergency Management Communications Center, which takes 505-844-0911 calls from Sandia cell phones and 911 calls from Sandia landlines, monitors alarm and other alert systems, and dispatches emergency personnel to incidents at Sandia.

And, the Labs' Emergency Operations Center will remain prepared to activate and respond to emergencies on-site. Other vital emergency functions also will continue, including Sandia Medical and Protective Force support. Sandia's program is designed to protect its employees, the public, property and the environment.

This reimaged Sandia emergency management blueprint will add to a comprehensive emergency management system that drives mitigation, emergency preparedness, response and recovery. "We'll build out and refine all of the pieces of our emergency management program to be better prepared for incidents at Sandia or Kirtland Air Force Base," David said.

"The Sandia team is making this transition a lot easier and more seamless," Chief Jimenez said. "I look forward to the special partnership we already have built getting even stronger with time." 

Recent Patents

July-September 2020

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).

- **David W. Chandler:** Apparatus, method and system for imaging and utilization of sem charged particles. Patent #10770262
- **Eric Allcorn and Christopher A. Apblett:** Cast thermal battery electrodes and separators using a salt binder. Patent #10727474
- **Randolph Brost:** Computer processing through distance-based quality score method in geospatial-temporal semantic graphs. Patent #10769158
- **Mohamed Salah Ebeida:** Constructing a conforming voronoi mesh for an arbitrarily shaped enclosed geometric domain. Patents #10776537 and #10776540
- **Anup K. Singh:** Detection of active and latent infections with microfluidic devices and systems thereof. Patent #10786811
- **John Joseph Borchardt:** De-tuning tolerant loop antenna. Patent #10756434
- **Yooli Kim Light and Robert Meagher:** Endpoint detection of amplified nucleic acids. Patent #10724091
- **David W. Raymond:** Fluid-powered linear motor with rotary pistons and motion rectifier. Patent #10767670
- **Nick Boynton, Christopher Todd DeRose, Thomas A. Friedmann, Michael Gehl and Anthony L. Lentine:** Heterogeneously integrated electro-optic modulator. Patent #10788689
- **Patrick L. Feng and Nicholas Myllenbeck:** Hydrothermal aging-resistant plastic scintillator formulations. Patent #10732304
- **Hung Loui:** In-situ active impedance characterization of scanned array antennas. Patent #10720703
- **Hung Loui and Brianna N. Maio:** Instantaneous ultra-wideband sensing using frequency-domain channelization. Patent #10788568
- **Peter G. Stromberg:** Jitter minimization flexure pointing system. Patent #10739609
- **Seema Singh:** Magnetically recoverable catalysts for depolymerization. Patent #10767027
- **Hongyou Fan and David Rosenberg:** Method for the preparation of uniform triaminotrinitrobenzene microparticles. Patent #10723671
- **Darren W. Branch, Philip Rocco Miller and David R. Wheeler:** Microfluidic package and method of making the same. Patent #10717079
- **Anup K. Singh:** Microfluidic platform for multiplexed detection in single cells and methods thereof. Patent #10731205
- **Sapan Agarwal and Matthew Marinella:** Mixed core processor unit. Patent #10776684
- **Kenneth Miguel Armijo and Richard Karl Harrison:** Modular low cost trackerless spectral sensor. Patent #10760972
- **Katharine Lee Harrison and Michael P. Siegal:** Nanoporous carbon as an anode material for Li-Ion batteries. Patent #10784511
- **Stephen Percival, Leo J. Small and Erik David Spoerke:** Nanostructured polyelectrolytes for ion-selective membranes. Patent #10766005
- **John Nogan:** Organic-semiconducting hybrid solar cell. Patent #10727428
- **Jason Hamlet:** Randomization of dangling nodes in a digital circuit design to mitigate hardware trojans. Patent #10706181
- **Timothy J. Boyle and LaRico Juan Treadwell:** Rapid synthesis of gallium alloys. Patent #10724120
- **Frances S. Chance, Christina E. Warrender:** Retinal-inspired method and system for improved detection. Patent #10765864
- **David P. Adams, Nicolas Argibay, Brad Boyce, Michael E. Chandross, Blythe Clark, Michael T. Dugger and Ping Lu:** Stable nanocrystalline metal alloy coatings with ultra-low wear. Patent #10763000
- **Jessica Anne Bierner and Dale L. Huber:** Superparamagnetic nanoparticles and nanocomposites. Patent #10720269
- **Albert Hummel and Jason A. Payne:** Systems and methods for augmenting a satellite-based navigation system with alternative position and timing data. Patent #10788590
- **Josiah Bigelow:** Systems and methods for shock-resistance memory devices. Patent #10780997

Solar panel fire prevention

CONTINUED FROM PAGE 1

Increasing the spark gap

The new in-line connectors have been built to activate at temperatures above 185 degrees Fahrenheit. When that happens, the special self-extinguishing material melts, fills in the crevasses or breaks in the wires and extends the spring, which increases the spark gap between wire conductors so they can no longer produce energy that leads to heat and fires. A combination of the speed of the reaction and the material's fire-resistant properties will stop a fire before it starts — in less than two seconds, Kenny said.

The self-extinguishing materials used in the connectors were developed from Sandia-based research originating out of the [Laboratory Directed Research and Development program](#). Current work with Guardian Sensors is funded through the [New Mexico Small Business Assistance Program](#) that provides technical assistance from Sandia and Los Alamos national laboratories to companies seeking to solve scientific problems.

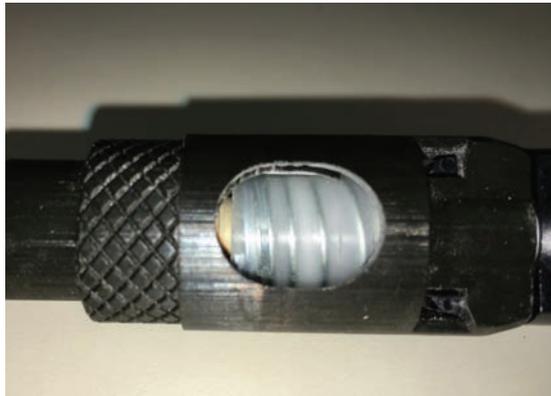
Through the NMSBA program, Sandia provided Guardian Sensors access to a patented, special arc-fault generator at the Labs. It was developed by researchers working to determine how dangerous arc faults are, and it can test different materials for reliability in high-voltage connectors and electrical wiring. For this project, Kenny tested a prototype of the connector for Guardian Sensors using the arc-fault generator, and results were successful.

Kenny has several photos, videos and data from multiple tests. One significant example shows a graph of lines that increase as voltage spikes, “then bam — the self-extinguishing mechanism works,” he said, pointing to where all lines on the graph make a sudden vertical decline to zero.

“You see this rapid shutdown, and it does it on its own,” he said. “To me, that is telling because it's effectively a set-it-and-forget-it kind of system. I think that's truly what makes this whole system really useful and impactful.”

Company earns prestigious awards

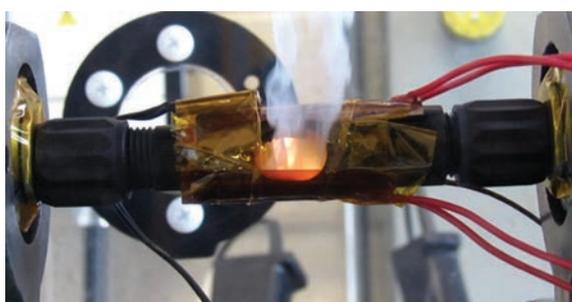
As a result of the technical assistance and success, Guardian Sensors received \$225,000 in cash



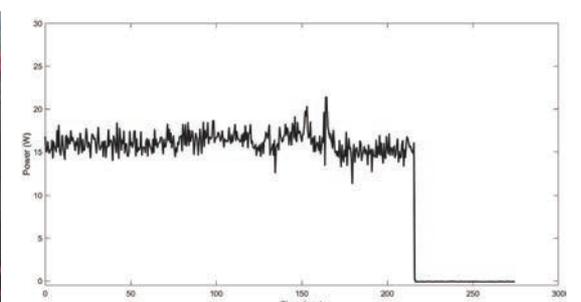
IN-LINE CONNECTORS — This image shows the inside of a self-extinguishing in-line connector developed by New Mexico company Guardian Sensors. The device is about the diameter of a dime and contains a metal spring covered in a special type of self-extinguishing polymer material developed and tested at Sandia over the past five years. **Photo courtesy of Kenny Armijo**



HIGH-VOLTAGE TESTING — An arc-fault generator at Sandia can test different materials for reliability in high-voltage connectors and electrical wiring. **Photo by Bret Letter**



STOPPING FIRES — These images show an example of a connector test, conducted at Sandia, at the moment of an arc fault and sudden self-extinguishment. The photo shows a fire from an arc fault while a self-extinguishing material melts and a spring extends inside the connector to facilitate a larger spark gap and stop the flames. The graph depicts self-extinguishment with a sudden voltage drop that occurred in less than a second. **Images courtesy of Kenny Armijo**



and vouchers from the DOE American-Made Solar Prize and provided research opportunities to three New Mexico universities. The company also was able to hire a new engineer and expand.

In addition, the company was awarded the Honorable Speaker Ben Lujan Award for Small Business Excellence, presented to an NMSBA participant that demonstrates the most significant business growth for the betterment of the New Mexico economy through sustainability and workforce development.

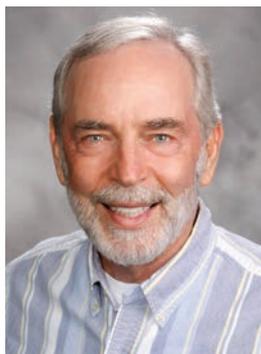
“I highly recommend the NMSBA program because with technical assistance, we were able to test and validate the circuit interrupters,” said Guardian Sensors program manager Kenny Blemel. “We could not have accomplished this without the help of Sandia researchers and

special equipment. We look forward to taking this to market for the benefit of companies providing alternative energy sources and for the public's safety.”

In the future, Kenny said he hopes research can expand to other types of power sources and storage devices, like batteries.

“We're looking at expanding this research to more than just connectors,” Kenny said. “I think the next step is seeing if we can extend something like this into energy storage, like batteries or anything that holds charge. At the end of the day, the way to make renewable energy work and be more adopted is to have storage, and Guardian Sensors and I are developing ideas and research around advanced energy storage technologies that will mitigate arc faults.” 

Mileposts

James Lauffer 35



Shawn Kerr 35



Jennie Lebow 30



Rekha Rao 30



Joe Ehasz 30



Karen Armstrong 30



Sara Sokolowski 20



Kathryn Hanselmann 20



Doris Willis 15



Mark Learn 15



Kate Galbraith 15



Doug Fried 15



John Eddy 15

Recent Retirees




Mark Stavig 35



Mark Johnson 30



Barbara Jennings 30



Loretta Humble 20



Bill Cowan 17



16TH ANNUAL HOLIDAY GIFT DRIVE
NOVEMBER 23 - DECEMBER 10

SANDIA CLASSIFIED ADS

Note: The classified ad deadline for the Dec. 4 Lab News is noon Friday, Nov. 27.

AD SUBMISSION GUIDELINES

AD SUBMISSION DEADLINE: Friday noon before the week of publication unless changed by holiday.
Questions to Michelle Fleming at 505-844-4902.
Submit by one of the following methods:

- **EMAIL:** Michelle Fleming (classads@sandia.gov)
- **FAX:** 505-844-0645
- **MAIL:** MS1468 (Dept. 3651)
- **INTERNAL WEB:** Click on the News tab at the top of the TechWeb homepage to visit the News Center, then select Announcements >> Submit Announcement.

Due to space constraints, ads will be printed on a first-come, first-served basis.

- MISCELLANEOUS**
- WOOD HEADER, laminated, 2" x 12" x 20", \$75; 3 plywood sheets, \$14 ea.; 15-ft. aluminum ladder, \$50; 6-ft. patio umbrella, \$38; RV lounge folding chairs; lots of RV equipment, plus tools. Garcia, 505-554-2690.
 - WINE CABINET, Indian Rosewood, 44-bottle, \$500 OBO; 2 Tiffany-style 15-light lily lamps, \$500 OBO; cigar drying box, \$500 OBO. Ordonez, 505-750-7782.
 - DRESSER, 6-drawer, 17" x 36" x 56", good condition, contactless pickup only, \$40 cash. Hartley, 352-872-2736.
 - MANHATTAN PROJECT, NUCLEAR WEAPONS & RELATED TOPICS, >120 books, magazine articles & pamphlets, \$2,500. Bono, 2924EFort@gmail.com.
 - PHOTO ENLARGER, Omega 822, & assorted darkroom supplies, free. Chapman, jchapm1111@gmail.com.
 - MISC. SELF-DEFENSE MATERIALS, books, magazines, no longer needed. Heckart, dgheckart@yahoo.com.
 - SOFA, Natuzzi, red leather, 90-in. long, ottoman, \$625 OBO; 3 skeins red rainbow boucle yarn, \$20. Malcomb, 505-400-9029.
 - ELLIPTICAL, NordicTrack ACT, like new, hardly used, \$550. Jaeger, 505-299-0860.
 - MOTORCYCLE JACKETS, sizes small/extra large, excellent condition, \$50 ea.; portable inverter generator, 3,100-W, Champion, \$550; East Mountains. Willmas, djwillmas@gmail.com.
 - '02 NISSAN MAXIMA SE, 6-spd. manual, leather, sunroof, Bose audio, 95K miles, good condition, \$3,000 OBO. Kropka, jmkropka@gmail.com.
 - '16 MERCEDES SPRINTER, 4x4, tall roof, X-wheel base, converted to camper w/ solar, heater, refrigerator, under-bed storage, \$72,199. Lacy, 505-974-0456.
- TRANSPORTATION**
- '01 LEXUS ES300 SEDAN, fair condition, runs well, new battery, new tires, high mileage, \$1,700 OBO. Rivers, 505-440-0257.
 - '14 TOYOTA CAMRY, only 27.3K miles, excellent condition, \$12,499. Nunez, 505-506-7619.
 - '10 SUBARU FORESTER TURBO 2.5 XT, Limited, AT, AWD, navigation, Bluetooth, heated seats, roof rails, 91K miles, \$10,900. Burns, 505-250-4040.
 - '14 AUDI A4, 4-dr., AWD, silver, gray leather, new tires, 64,950 miles, very nice condition, clean title, \$17,500. Tarango, 505-306-9963, text only.
- RECREATION**
- REAL ESTATE**
- 4-BDR. HOME, 2-1/2 baths, 3,060 sq. ft., 2-car garage, stainless appliances, huge master suite, office & dining, outdoor kitchen, 2027 Northlands SE, \$415,000 FSBO. Pepple, mpepple21@gmail.com.
- WANTED**
- INFORMATION MAP-PING MANUAL, hard copy only, new or used. Jordan, 505-803-6381 or Redbird@99dakota.com.

Honoring those who served

Virtual celebration marks Veterans Day at Sandia



HONORING THOSE IN UNIFORM — Colonel Sergio de la Peña, former deputy assistant secretary of defense for western hemisphere affairs and retired U.S. Army officer was the keynote speaker at Sandia's 2020 Veterans Day celebration.



STATE APPRECIATION — New Mexico Governor Michelle Lujan Grisham expressed gratitude for the service and sacrifice of Sandia's veterans and their families.

Images courtesy of Sandia Military Support Committee

By Paul Rhien

Hundreds were in attendance as Sandia's Military Support Committees held their annual Veterans Day Celebration on Nov. 12. The ceremony — held virtually this year due to the pandemic — honored the achievements and sacrifices of Sandia's veterans, active military personnel, guardsmen, reservists and their families.

Traditionally, Veterans Day events are organized at Sandia's Albuquerque and Livermore sites to mark the holiday. Because the ceremony was held via livestream, it created a rare opportunity to bring the Labs together for a single, combined event. Distinguished guests and active duty military members from Kirtland Air Force Base also were in attendance.

Saluting Sandia's veterans

"Veterans are an important part of Sandia's rich history, our present and our future," said Andy McIlroy, associate labs director for Integrated Security Solutions, as he addressed viewers. "Every day, Sandia directly supports warfighters around the world in many ways. I know that our great nation is stronger and safer because of the work we do at Sandia. Much of this work is accomplished and enabled by veterans."

Veterans make up about 10% of Sandia's workforce.

In pre-recorded remarks, New Mexico Governor Michelle Lujan Grisham thanked military, Sandia employees and families.

"There's no adequate way for me to express my profound gratitude to all of you," Lujan Grisham said. "We can never fully repay the debt we owe our nation's veterans."

"It's been an incredibly challenging year for all of us," she said. "But one thing I've been reminded of amid these crises is that the willingness to serve is a core American value and a New Mexico value too. Service is a calling and those who answer the call exemplify the best of our values — the willingness to stand up and act, the bravery and courage it takes to think of others before yourself, to make an individual effort to support a collective good."

Albuquerque Mayor Tim Keller and Kirtland Air Force Base Commander Colonel David Miller also addressed attendees in the video.

Experience of a lifetime

Colonel Sergio de la Peña, former deputy assistant secretary of defense for western hemisphere affairs and retired U.S. Army officer was the event's keynote speaker.

Recently retired from his post as deputy assistant secretary of defense for western hemisphere affairs at the Pentagon, de la Peña reflected on his more than three decades of military service in a variety of staff and leadership positions.

From a young age, de la Peña was mentored by employers and high school teachers who were veterans, and who shared their life experiences, taught him how to work and to appreciate the value of those who have worn the uniform of military service.

"Those were the guys that had the biggest impact on my life; I was grateful for all they taught me," de la Peña said as he named several teachers and mentors with fondness. "These are the kinds of people — these veterans — who form and shape you."

After his older brother encouraged him to join ROTC at Eastern New Mexico University in Portales, de la Peña continued on to Airborne and Ranger school and spent more than 30 years in the U.S. Army.

"It was the experience of my life," he said. "We learned from the best. One of the things I always appreciated was the level of sacrifice that people were willing to make to get the job done, to protect our country, to be ambassadors of who we are to the rest of the world."

"I met the finest people that I've ever met in my life while I was in military service. I learned that my heroes were really pretty much across the board in all of the armed services and the many civilians that supported us. And that includes the work that you do at Sandia."

De la Peña closed his keynote address by thanking Sandians for their service to the nation, especially the veterans. "I owe a debt of gratitude that I can never repay. I will always do my very best with the gratitude that comes from having served and learned from so many of you."

Challenge coin recognition

Sandia veterans were presented with challenge coins, representing a token of appreciation to all of Sandia's veterans and service members. Due to the virtual nature of the event,



veterans and current or former service members are invited to reach out to the Military Support Committees to obtain their coins from this year's commemoration.

Additionally, the MSCs invite Sandians to help honor those who are currently deployed. If you know a Sandian, relative, friend or neighbor who is deployed, please send their name and military address to the MSC in California or New Mexico. They will work with the Blue Star Moms to ensure the delivery of a care package to the deployed service member.

Employees can [view the recorded event](#) on the Labs' internal Digital Media library or visit wp.sandia.gov/msc to learn more about Sandia's MSCs, claim their challenge coin or help support deployed loved ones.



STAR-SPANGLED SONG — The Sandia Singers performed the national anthem during the Labs' 2020 Veterans Day virtual event.