LABS ACCOMPLISHMENTS

SANDIA LAB**NEWS**
March 2024

Exceptional service in the national interest

A LETTER FROM THE **LABS DIRECTOR**

I am proud to introduce the latest edition of Labs Accomplishments, an annual publication of Sandia Lab News. The projects and initiatives showcased within these pages, all achieved in fiscal year 2023, are extraordinary. Sandians delivered again and again in service to our country.

This edition is a testament to the work of a staff whose dedication to national security is unwavering. You'll discover accomplishments across all our mission areas and appreciate how Sandia's multidisciplinary expertise has been pivotal in addressing a spectrum of national security challenges.

Not all of Sandia's endeavors can be captured here, especially those of a highly sensitive nature. Nevertheless, this volume highlights significant strides in such areas as stockpile stewardship, nonproliferation, homeland protection, energy security, national security and global alliances. It celebrates the Labs' leadership in safety, quality and employee benefits, as well as our philanthropy in times of need.

Each member of the Sandia staff is crucial to our missions, with every achievement stemming from a synergy of talent and commitment. Now more than ever the demand for our work is paramount. Our responsibilities, which include ensuring the safety, reliability and effectiveness of the nation's nuclear deterrent, grow increasingly vital by the day.

I invite you to explore Sandia's work.
It's an experience you won't soon forget.

James S. Peery
Sandia Laboratories Director

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Photos by Craig Fritz

In preparation for a series of 10 proficiency tests in the 300-foot blast tube, technologists cut through a weld to make two separate sections. The tests demonstrated the largest pressure and longest pulse duration known from any NNSA facility. The final flow shot incorporated the suspension and release of a mass mock test unit and met multiple technical, safety and program objectives. The work provides nuclear deterrence sponsors access to environments that were previously unreachable.

At 160 feet above ground, mechanical engineer Ken Armijo, in the green hard hat, leads a tour of the National Solar Thermal Test Facility for 42 students from STEM programs in Gallup and Grants, New Mexico.

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Sandia National Laboratories

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NUCLEAR **DETERRENCE**

An inert B61-12 is prepared for testing.

B61-12 program reaches 50% production milestone

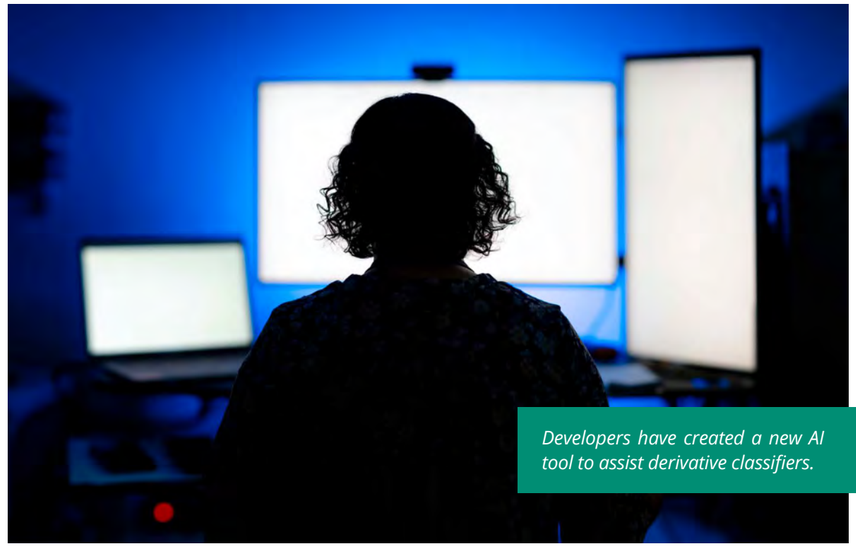
Through significant collaboration with nuclear security enterprise partners, the B61-12 program met its 50% production milestone. The team resolved numerous complex challenges. Each resolution brought a better understanding of design and production. This milestone was achieved through strong collaboration between the design and production agencies, who maintained steady-state production to deliver on this critical program. • *1000, 2000, 3000, 5000, 7000, 8000, 10000*

SWSIE aids impact analysis

The principle-based Strategic Work Scope Inquiry and Evaluation process significantly aided the Labs' strategic direction by assuring existing commitments aren't put at risk and that new work requiring resources beyond one's direct control is not accepted without input from those affected. New work scope requests that meet thresholds are evaluated, judged and logged to show evidence of consideration and regarded as establishing precedent to ensure work aligns with strategy and enables future needs. • *2000, 7000*

New design tools improve production

Sandia implemented Design for Manufacture and Assembly tools for electrical and mechanical design staff by teaming extensively with Kansas City National Security Campus to implement rules based on its manufacturing guides. Electrical and mechanical design teams will introduce manufacturing knowledge earlier into the design process to improve production and reduce feedback loops and late changes. • *2000, KCNSC*



Developers have created a new AI tool to assist derivative classifiers.

Using AI to assist derivative classifiers

Developers from Sandia, Lawrence Livermore and Oak Ridge national laboratories and the Y-12 National Security Complex used a pair of classification guides to demonstrate how artificial intelligence can help identify classified information in documents from three datasets. The team plans to develop coverage for more classification guides, with the goal of enabling derivative classifiers across the DOE complex to use AI to identify potentially classified information in electronic documents. • *2000, 4000, 5000, 9000, 10000, LLNL, ORNL, Y-12*

First X-Flyer test conducted in over a decade

The Light Initiated High Explosive team conducted the first full-scale, explosively accelerated flyer plate test, called X-Flyer, in over a decade, then conducted a second full-scale test to demonstrate repeatability. Both tests were performed on the Joint Technology Demonstrator GT3B body, demonstrating a high-fidelity cold X-ray-induced mechanical response, an aboveground simulator capability that is unique to the nuclear weapons enterprise. • *7000*

Innovative spray technology improves efficiency and safety

Innovative spray technology equipment for production was designed, procured and installed to reestablish a production capability that improves efficiency and safety through use of an interlocking mechanism and a sealed inert chamber. The project encompassed rigorous site acceptance testing, major facility modifications and complex equipment installation, startup and characterization — all completed on a highly accelerated schedule. • *1000, 4000, 7000, 9000*

Review process saves time and money

The Stockpile Systems and Multi-Weapon Systems projects successfully reduced the frequency of Management Review 1 for approximately 17 projects that are stable and performing well. This has reduced hours spent in meetings for line participants, leadership, Sandia Field Office partners, technical leads, analysts and liaisons, saving about 600 hours annually. A streamlined approach to more concise and intentional presentations also meant more time could be focused on program integration. • *300*

Model-based quality management system deployed

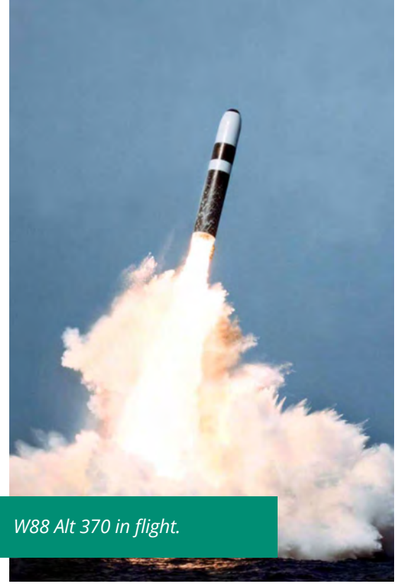
Sandia modernized its Weapon Quality Management System by creating and deploying a model-based tool that allows easy visualization of key quality procedures, making the system easier to learn and use. This new tool also will enable future systems engineering for other elements of the system to improve process efficiencies and reduce time and energy required to develop new products. • *2000, 9000*

Electronic Parts Program completes high-impact projects

In its first year of executing projects, the Electronic Parts Program had several noteworthy achievements for stockpile and modernization programs. The W87-1 continues to follow Electronic Parts Program requirements. All systems have benefited from strategic sourcing efforts by the program to mitigate geopolitical supply chain threats. • *7000*

First national-level accident response exercise in four years

Sandia successfully completed the first national-level Nuclear Weapon Accident Incident Exercise in four years, after events were canceled due to COVID-19 restrictions. The Accident Response Group of responders from across Sandia New Mexico and California partnered with NNSA, DOD, and other nuclear security enterprise and federal agencies to exercise this critical capability. • *6000, 7000*



W88 Alt 370 in flight.

W88 Alt 370 production halfway home

Half of the W88 Alt 370 program of record, which sustains and refreshes the deterrence mission of the W88/Mk5 system, was completed. In concert with this achievement, more than half of W88-0 systems have been modernized with the turnaround of the Alt 370 production. This success is underpinned by the production support of the design agency and strong partnership with production agencies such as the Kansas City National Security Campus, Pantex Plant, the Y-12 National Security Complex and the Savannah River Site.
• *7000, KCNSC, Pantex, Y-12, SRS*

Digital engineering improves thermal battery production

The Power Sources Technology Group applied Set-based Concurrent Engineering, an agile digital engineering method, to improve thermal battery production. Modeling of thermal battery activation enabled a comprehensive analysis that led to understanding the impacts of material processing on overall performance to customer requirements and avoided $1 million in costs. These tools can identify areas for research and development investments or for developing new proposals.
• *1000, 5000, 7000*

Mk21 Fuze program nears qualification and production milestones

All major components of the Mk21 Fuze have reached first-production unit status and are in production. The fuze successfully completed final qualification testing and analysis activities, including electrical, mechanical, radiation, materials, ground and flight tests and associated performance analyses. Final qualification results support the 2024 Qualification Engineering Release and first production unit for the fuze program. • *1000, 2000, 5000, 7000, 8000, 10000*

Accumulated damage test unit at Superfuge/Centrifuge Complex.

Telescopic excellence

Since its launch, the Wide Area Space Situational Awareness Telescope onboard processing system has demonstrated excellent performance with confirmed detections of neighboring space objects. For the telescope, Sandia trained and deployed a convolutional neural network to replace a large traditional image processing chain, greatly simplifying onboard implementation and enabling rapid improvements to mission data processing on orbit.
• *1000, 5000, 6000, 7000*

Wide Area Space Situational Awareness Telescope.

First development W80-4 flight test

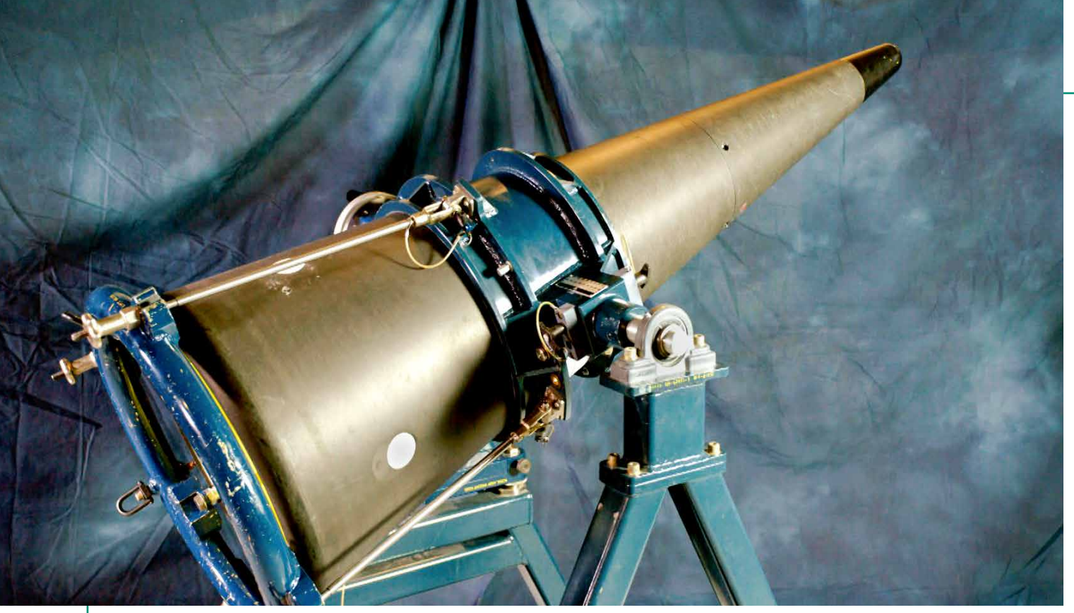
The W80-4 team completed its first flight test with a fully functional, instrumented W80-4 test unit aboard a development version of the Air Force Long-Range Stand Off cruise missile. The missile flew a representative flight profile and the W80-4 test unit successfully demonstrated compatibility with the missile throughout flight, including simulated warhead yield over target.
• *2000, 8000, KCNSC, LLNL*

Rendering of a W80-4 warhead case.

W80-4 program replan approved

The W80-4 program completed and received NNSA approval for its cost and schedule replan. The major effort by the W80-4 Systems Program Management team began at the start of 2023 to align the program with delivery of the first production unit in 2027. The replan is designed to help the program assess risks, identify priorities and streamline processes.
• *8000*

W80-4 Life Extension Program logo.

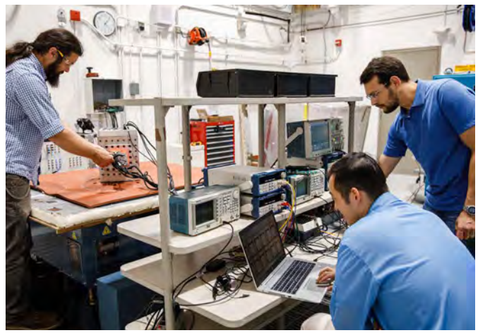


Evaluation efforts keep stockpile safe

Sandia's Stockpile Evaluation Program completed a high workload of testing, tester development, data analysis and new program onboarding. On the modernization programs, the Weapon Evaluation Test Lab completed 17 system lab tests on the B61-12 and 16 on the W88 Alt 370. For core surveillance, 22 system flight tests and more than 50 system lab and 100 component tests were completed. • *2000, 7000, 8000*

W80-4 JTA baseline design review completed

The W80-4 joint test assembly team completed its baseline design review, during which an independent panel of experts from Sandia and Lawrence Livermore National Laboratory evaluated the completeness and stability of the baseline design and assessed its readiness to proceed to a final design. The assembly team partnered with other Sandia organizations and across the nuclear security enterprise to test the design, building five ground and flight test units and culminating in flight tests with the Air Force Long-Range Stand Off cruise missile. • *2000, 8000, LLNL*



Staff members conduct shock and vibration qualification testing on the last development build of the W80-4 joint test assembly telemetry.

B61-12 aerodome modeling, simulation accelerates issue resolution

B61-12 aerodome.

The B61-12 program quickly developed technical basis for the structural strength of the B61-12 aerodome by using modeling and simulation to answer high-priority unsatisfactory reports. This activity investigated the effects that typical manufacturing imperfections have on the strength of the overall structure and resulted in increased technical basis for understanding the design. • *1000, 2000, 7000*

Peer review improves W80-4 warhead case team processes

The W80-4 Warhead Case Product Realization Team asked the Neutron Generator Production Team to conduct a peer review of operations in the Sandia California Lightweight Structures Lab. While Sandia is not the production agency, the product realization team is responsible for producing about half of the development hardware crucial for qualification testing of the W80-4 warhead. The neutron generator team evaluated all aspects of the development build process. • *8000*

A virtual technologies manager interacts with models using Sandia's digital engineering visualization capabilities.

Digital engineering, virtual reality rooms aid collaboration

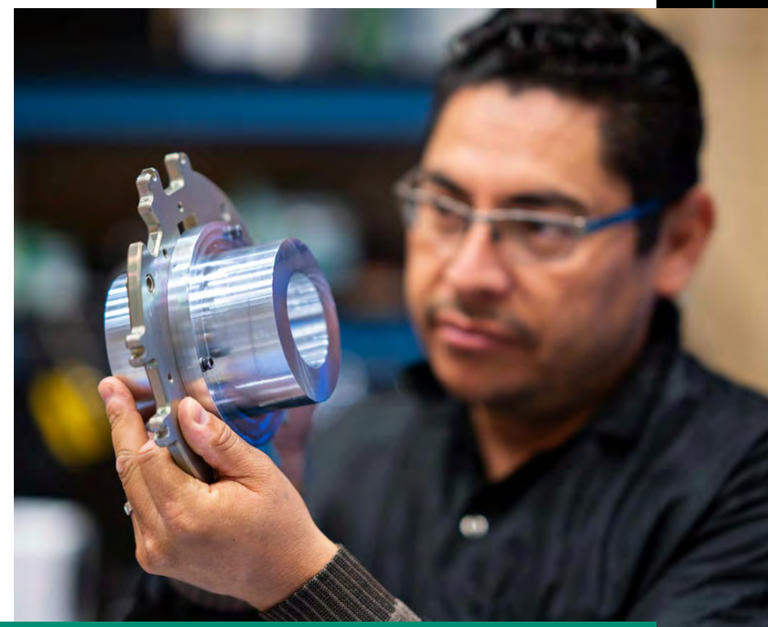
Sandia established three digital-engineering war rooms at the New Mexico and California sites. The rooms, with access to multiple classified and unclassified computer systems, allow interdisciplinary teams to use digital-engineering tools to collaborate and codevelop. The team also established more than a dozen virtual reality-capable rooms in New Mexico, California and Texas to help teams in different physical locations work together more effectively. The systems apply digital engineering tools for improved communication, knowledge preservation and accelerated product realization.
• *2000, 5000, 7000, 8000, 9000*

Improved process for additive manufacturing

The Electro3D additive manufacturing process, which simultaneously analyzes and manufactures materials, was launched. Electro3D is more energy efficient than current metal 3D printers. The technology is scalable, deployable, can print multimaterials with rapid transition and seamlessly integrate with machine learning techniques to address the needs of many customers. The project is rooted in the recent Advanced Manufacturing Techniques of Thermoelectric Modules project sponsored by Laboratory Directed Research and Development and won an R&D 100 Award last year in the Process/Prototyping category. • *7000*

New onboarding program makes big impact

Sandia's Product Delivery Value Stream group brought on 45 staff members through a new program designed to enable their success and better integrate them with their new team. This dynamic program helps staff become familiar with nuclear deterrence programs while providing the tools and resources they need to execute their jobs effectively as the next generation of experts in purchased products and limited-life components manufacturing. • *7000*



An electronics technologist inspects parts for the Enzo Flight Demonstrator.

Flight demonstrator supports critical test

The Enzo demonstrator team developed and delivered an experimental reentry vehicle within a tight two-year deadline for a critical flight test to perform relevant technology demonstrations and experiments. The accelerated schedule required partnerships with Los Alamos National Laboratory, NNSA and others. More than 100 Sandians contributed to the success of project that produced streamlined design, integration and test methodologies and lessons learned for how to develop, test and deliver faster across the nuclear security enterprise. • *1000, 2000, 5000, LANL*

W80-4 team completes development engineering activities

The W80-4 team successfully completed all Phase 6.3, development engineering, activities and received NNSA approval to move into Phase 6.4, production engineering, following completion of its system preproduction engineering gate. Leading up to the production engineering phase, the team successfully completed a preliminary review with the Design Review and Acceptance Group, chaired by the Air Force Global Strike Command chief scientist, with members from the Air Force, Navy and Army. The group determined that the baseline W80-4 design meets the DOD military characteristics and stockpile-to-target-sequence requirements. • *2000, 8000, LLNL*

Superior capacitor technology selected

Polymer multilayer main capacitor versus mica main capacitor.

The W87-1 Firing Set Assembly and Capacitors Product Realization teams successfully identified a new main capacitor technology. These capacitors have not been used previously for nuclear deterrence but offer capacitance equivalent to traditional mica or Mylar technologies at one third of the volume with superior performance in strategic radiation environments, with a third less charge loss from ionizing radiation. Viability of this capacitor technology was demonstrated during successful radiation testing at the Annular Core Research Reactor. • *7000*

Integrated Surety Architecture achieves first production for vital programs

The Integrated Surety Architecture program achieved first production for the W88 Alt 940 and B61-12 Multiapplication Transportation Attachment Device systems. Diamond-stamped Alt 940 hardware was delivered to the Pantex Plant and installed to complete first production of a new shipping configuration for the W88/Mk5 reentry body assembly. Integrated Surety Architecture provides an additional layer of security during NNSA transportation, and product realization has been a multicenter effort in partnership with Los Alamos National Laboratory, the Kansas City National Security Complex and the Pantex Plant.
• *6000, 7000, 8000, LANL, KCNSC, Pantex*

W87-1 ground test unit 1.

W87-1 program enters development engineering phase

The Nuclear Weapons Council approved the W87-1 program to enter Phase 6.3, development engineering, and the conceptual design review of the system was completed. The review was followed by 23 component reviews and the system conceptual design gate. Program requirements continued to mature, and the team successfully completed multiple system characterization activities. Close partnerships with Lawrence Livermore National Laboratory and the Pantex Plant, including an early conceptual Hazardous Analysis Task Team effort, will support future successes.
• *3, 5, 2000, 3000, 5000, 7000, 8000, 10000, LNLL, Pantex*

A Sandia staff member investigates a W80-4 assembly.

Warhead sectioned and remotely machined for analysis

The Explosives Technology Group explosives machine shop collaborated with the W80-4 program to section a high-explosive warhead for analysis, marking a first-of-its-kind effort for Sandia to remotely machine an assembly that contained high explosives. The application of technologies such as computed tomography, 3D laser scanning and robotics minimized personnel exposure to hazards throughout the process. The successful outcome demonstrated and highlighted the Labs' broad engineering, teaming and explosive operations capabilities. • *7000, 8000*

Enhanced surety program meets urgent need

Sandia provided design and system integrator oversight to deliver an enhanced surety program to meet changing U.S. Air Force mission requirements in a rapid fashion. The effort required close coordination with DoD partners and teams across Sandia and Los Alamos National Laboratory. Sandia managed high-risk supply chain challenges and applied rapid prototyping to production cycles while meeting or exceeding weapon product requirements and the highest NNSA quality rigor. Global security teams provided nuclear deterrence with substantial technical expertise during the installation. • *2000, 6000, 7000, LANL*

Network launches to support ND manufacturing production and development

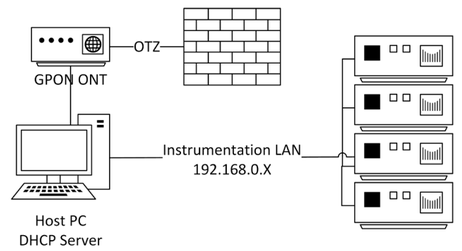
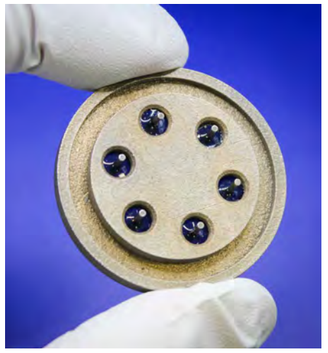


Illustration of the Unclassified Operational Technology Network.

The Unclassified Operational Technology Network — a mission-enabling innovation that establishes a secured network branching from Sandia's enterprise network — was launched to support nuclear deterrence manufacturing production and development. The network accommodates unclassified production equipment and software that cannot connect to the enterprise network. As this network simplifies security accreditation for this class of equipment, it also lays the groundwork to enable smart manufacturing at the Labs. • *7000*

Hermetic connector produced using 3D-printed metal shell

Sandia produced a hermetic connector using a 3D-printed metal shell. This achievement supported the Rapid Development Connector project with the goal of maturing Labs technologies and workflows to produce electrical connectors for early development. It also has the potential of drastically reducing — in some cases, up to a year or more — the lead time to design, manufacture and test custom electrical hardware used in a variety of programs.
• *1000, 7000*



GLOBAL **SECURITY**

A computer engineer prepares a payload for integration testing.

Technology tested in orbit

Sandia used the International Space Station as a proving ground to develop a process to rapidly test and mature technology in space. Astronauts installed a payload containing a computer chip with advanced processing capabilities aboard the space station to test high-performance computing technology. Testing in orbit reduces time needed to deploy national security systems and helps mature research for space readiness. Data generated from each payload hosted on the space station will ultimately enable the Sandia team to be more responsive to national security threats and opportunities. • *6000*

Safeguards Transporter Compatibility Retrofit

The Safeguards Transporter Compatibility Retrofit achieved first production unit, with two Safeguards Transporter trailers completing installation of Integrated Surety Architecture hardware at the Kansas City NNational Security Complex-New Mexico Operations site. Integrated surety architecture provides an additional level of security for over-the-road transportation of NNSA assets. The Sandia and KCNSC-New Mexico Operations partnership will continue beyond initial qualification to complete conversion of the entire Safeguards Transporter fleet and maintain transporters through the end of fleet life. • *6000*

Next-generation counter-uncrewed aircraft systems

Sandia's Autonomy and Unmanned Systems Team developed requirements for the next generation of counter-uncrewed aircraft systems. The document will be the basis for NNSA's acquisition and deployment strategy in fiscal years 2024-2030. The requirements included an open-architecture approach, which will allow the NNSA and its interagency partners to rapidly adapt to new technologies and address evolving threats. • *6000*

Next-generation counter-uncrewed aircraft systems in use.

Ground system supports new satellite sensors

The Consolidated Overhead Ground System project delivered and tested initial operational software and hardware for commanding and processing satellite data for current and new sensors. The 100-plus person team delivered a complete hardware and software system on a high-risk schedule after a late change in acquisition approach. Despite changes to the launch schedule and scope, Sandia delivered the ground system, including 3 million lines of code, on time for successful integrated testing and new sensor checkout. • *6000*

Secretary of Energy Achievement Award

The Afghan Rescue Team received a Secretary of Energy Achievement Award for their collaboration with the DOE and the Department of State to evacuate and relocate Afghan partners who supported chemical, biological, radiological and nuclear security nonproliferation and counterproliferation programs. This program has evacuated more than 450 partners and their families. • *6000*

Minikin Echo

Ground-based seismoacoustic sensors detect explosions

On behalf of NNSA and the DOD, Sandia rapidly deployed Minikin Echo, a suite of seismoacoustic sensor arrays, in Eastern Europe to detect explosives in the Russia-Ukraine war. Since the deployment, Sandia and Los Alamos National Laboratory Minikin Echo teams have delivered 24/7 hardware and on-call operational support to federal leadership. The teams were recognized by the NNSA Office of Counterterrorism and Counterproliferation for their outstanding support of the nuclear forensics mission. • *6000*

Improved accuracy for sensors over Europe

A hardware and software system includes a modified commercial LED panel and a Sandia-developed star tracker system for geolocation that doesn't need GPS.

In support of U.S. European Command work in Eastern Europe, Sandia developed and deployed a hardware and software system that provides improved calibration of operational intelligence, surveillance and reconnaissance sensors. This effort used years of U.S. Air Force research and development to build and integrate necessary hardware and develop real-time data processing algorithms for new calibration sources. The operational sensors can detect calibration signals in real time and increase sensor accuracy, providing critical data to decision-makers. • *6000*

New application tracks waste shipments

Sandia developed the Transportation Remotely Monitored Sealing Array application to track waste shipments from the Savannah River Site to the Waste Isolation Pilot Plant. The application monitors location and assures nuclear safeguards. The director of the Office of Material Disposition designated the system as ready for use, culminating years of collaboration among Sandia, Savannah River Nuclear Solutions, the NNSA Office of Material Disposition, Kansas City National Security Campus, WIPP, Sandia Field Office and the Carlsbad Field Office. The application tracked a total of 13 WIPP shipments in fiscal year 2023. • *6000*

Autonomous satellites team together

A multilaboratory team demonstrated a new autonomous remote sensing solution that enables a cluster of relatively small and inexpensive satellites to work together as a single, autonomous unit. The payload prototype demonstrated command, control and data fusion architectures for space-based collection systems that are capable of processing and autonomous decision-making. Sandia's role included developing machine learning and autonomy algorithms, radar sensors, computer models, communications protocols and flight software. • *6000*

A cluster of relatively small and inexpensive satellites share data to work together as a single, autonomous unit.

The Y-12 NNSA Production Office and Sandia safeguards and security professionals.

PIDS Team wins NNSA security award

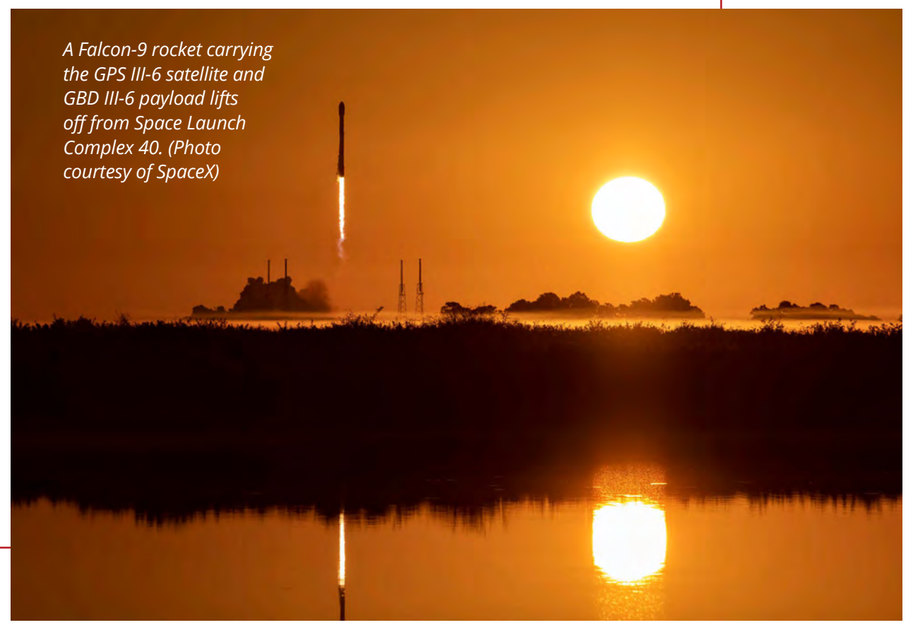
Sandia and Consolidated Nuclear Security LLC received NNSA's award for Outstanding Security Team of the Year for the successful implementation of the Portable Intrusion Detection System at the Y-12 National Security Complex. The system supports the Security Infrastructure Revitalization Program, which is refreshing the security perimeter at Y-12. The deployment allows the site to meet security requirements during the security system refresh. • *6000, Y-12*

Mobile Guardian Transporter preproduction unit delivered to KCNSC

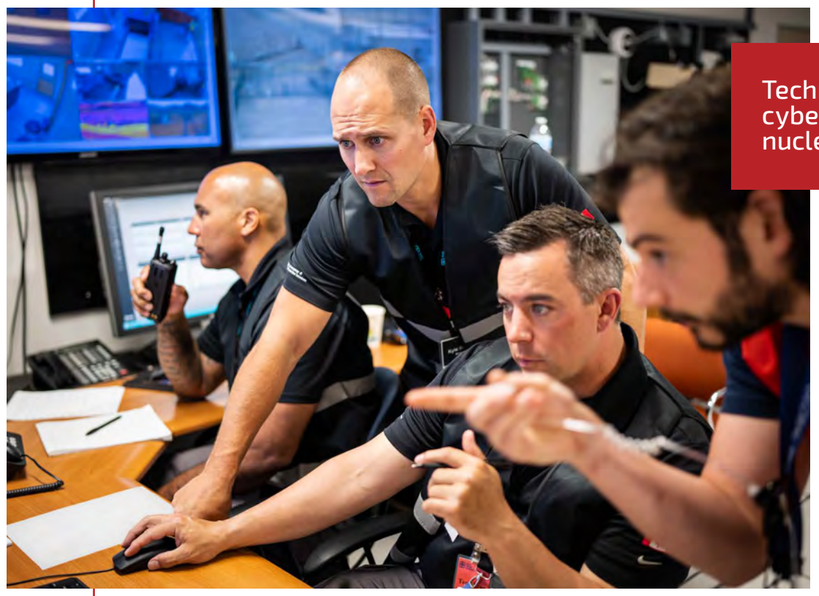
Sandia successfully completed initial modifications to the Mobile Guardian Transporter preproduction unit rolling chassis and delivered it on time to Kansas City National Security Campus-New Mexico Operations site. The effort included small and large modifications to internal and external mechanical interfaces to support future subsystem integration by KCNSC-New Mexico Operations. After the preproduction unit assembly is complete, it will return to Sandia to serve as the Mobile Guardian Transporter program's primary system qualification platform and continue as the permanent test and evaluation platform for the transporter fleet. • *6000*

Global Burst Detector satellite operating

A Falcon-9 rocket successfully launched, delivering the satellite containing the sixth Global Burst Detector payload to its target orbit. Sandia and Los Alamos National Laboratory designed and produced the payload subsystems, with Sandia as the system integrator. Sandia met major milestones to test and characterize the payload pre- and post-launch, which resulted in successful transition of the system to operations. Global Burst Detector payloads provide space remote sensing capability for the U.S. Nuclear Detonation Detection System. • *6000*



A Falcon-9 rocket carrying the GPS III-6 satellite and GBD III-6 payload lifts off from Space Launch Complex 40. (Photo courtesy of SpaceX)



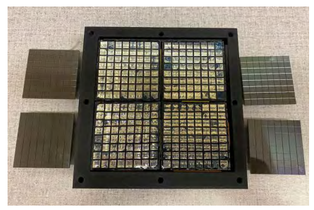
Global security staff works with a team from a private Canadian nuclear power plant during a cyberattack exercise on May 17.

Technology addresses cyberattacks on nuclear power plants

With Idaho National Laboratory and alongside 45 security professionals from the Canadian Nuclear Laboratories, Sandia conducted an exercise at the Labs' Nuclear Security Technology Complex to explore cyber and physical security gaps. The exercise successfully demonstrated a new Sandia-developed technology that emulates a cyberattack without compromising operation of a site's critical systems, enabling more efficient and effective security analyses for civilian nuclear power plants. • *6000, INL, CNL*

New neutron detector addresses emergency response needs

A neutron detector that addresses nuclear nonproliferation and emergency response needs was developed by configuring Sandia's organic glass scintillator into a pixelated format and integrating it with solid-state photodetectors. A detector array of more than 1,000 channels was read out using a system developed for medical imaging to achieve neutron radiographs. The new detector is more compact and rugged than current detectors and showed a twofold improvement in intrinsic neutron detection efficiency. • *8000*



A single detector array module before final assembly.

Detecting radiation from a remote location

View from the test site with measurement locations marked.

Sandia demonstrated remote long-range detection and imaging of ionizing radiation at longer distances in less than a minute outdoors at night using passive nitrogen fluorescence signatures, vastly surpassing previous measurements. This meets a long-term goal of detecting radiation from a location well beyond the distance primary gamma radiation propagates and represents the farthest known demonstration of remote imaging of radioactive sources. • *6000*

Uranium isotope neutron signatures demonstrated

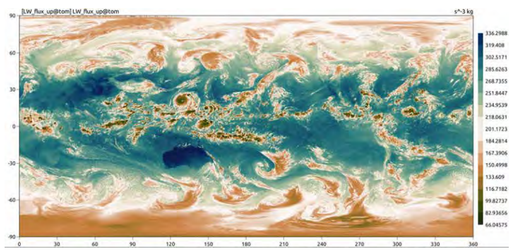
Novel neutron signatures of uranium-233 were demonstrated at the National Criticality Experiments Research Center in Nevada as a proof of concept for future nuclear safeguards techniques. The passive fast-neutron spectrum of kilogram-scale uranium-233 oxide was measured, in addition to two active interrogation signatures: differential die-away and delayed neutron time profile. The demonstrations address a high-priority area for the nuclear safeguards community. • *8000*

ADVANCED **SCIENCE & TECHNOLOGY**

Through a series of 10 characterization tests in a 300-ft blast tube, Sandia provided data for ND sponsors showing how well nuclear weapons could survive the shock wave of a blast from an enemy weapon.

Record-breaking pulse duration provides data

A series of 10 characterization tests of Sandia's 300-foot blast tube demonstrated the largest pressure and longest pulse duration known from any NNSA facility. The final flow shot incorporated the suspension and release of a mass mock test unit and met multiple technical, safety and program objectives. This work will provide access to environments that were previously unreachable. • *1000*



Visualization of an ultra-resolved SCREAM climate simulation shows radiative heat leaving the Earth system on a latitude-longitude projection.

SCREAM model demonstrated at exascale

Climate model developers at Sandia and Lawrence Livermore national laboratories, partners on the Energy Exascale Earth Systems Model project, have run a model of the global atmosphere of unprecedented resolution on Frontier, the world's first exascale supercomputer. The Simple Cloud-Resolving E3SM Atmosphere Model, or SCREAM, exceeds one year of simulation per day of computer time. This achievement was recognized with the inaugural Gordon Bell Prize for Climate Modeling. • *1000, 8000*

Sandia used a six-degree-of-freedom high-frequency vibration shaker to test the mechanical response of an nuclear deterrence modernization unit.

Six-degree-of-freedom testing for ND modernization

The first six-degree-of-freedom testing on a nuclear deterrence modernization system characterized the system's mechanical response using a highly instrumented mass mock unit. Testing in this series includes mass properties, six-degree-of-freedom random vibration and shock transportation, and flight testing. Using six-degree-of-freedom testing greatly reduces overall testing time, and results will help determine viability for system-level testing. • *1000, 2000*

Modernizing sheet metal processes

Materials Data Driven Design is an innovative software that uses machine learning to identify the directional mechanical behavior of metal alloys. This web-based application enables accurate and efficient anisotropy prediction without time-consuming experiments or high-fidelity simulations. The software was recognized as one of the top 100 innovations of 2023 by R&D World. It also received special recognition and a silver medal in the market disruptor category of the R&D100 Awards. • *1000*

Model holds promise for sustainable aviation fuel

With biomass-derived sustainable aviation fuels holding significant potential for decarbonizing the industry, Sandia implemented a method for evaluating the impact of different bioenergy crops and associated soil-organic-carbon sequestration on the price of the fuels. The method integrates an agroecosystem model with a model of the production process for aviation fuel that begins with field harvests. Assigning a monetary value to soil-organic-carbon sequestration results in substantially different outcomes on fuel-sale price for each feedstock. These findings underscore the need to establish clear and consistent values for soil-organic-carbon sequestration to enable the future bioeconomy. • *8000*

Interlaboratory collaborations maximize research strengths

A new joint NNSA Interlaboratory Laboratory Directed Research and Development Collaborations Program aims to produce transformational outcomes in high-energy-density science, biosecurity, climate for national security and advanced materials manufacturing. A call for joint interlaboratory LDRD proposals from Sandia, Los Alamos and Lawrence Livermore national laboratories and the Nevada National Security Site garnered 79 proposals, of which four to six proposals will be funded. The program will harness the combined strengths and capabilities of LDRD programs at multiple laboratories to further progress on shared national strategic goals. • *1000, LDRD*

Providing reliable connections at Pantex

A new cable assembly aid for the Pantex Plant will reduce the likelihood of damage to cables during testing and provide repeatable and reliable connections during assembly and disassembly. A multidisciplinary team used 3D printing technology and materials to take advantage of increased cycles of learning and design iteration, enabling rapid design of the fixture. Final design was completed in only a few months but will lead to a cost savings estimated at tens of millions of dollars. • *1000, 7000, 8000*

Modern plutonium test capability reestablished

A modern plutonium test capability for the nuclear security enterprise was reestablished through the work of a multidisciplinary team, which performed the first series of plutonium experiments in support of stockpile stewardship at the Annular Core Research Reactor. The experiments measured the effects of pulsed neutron-gamma environments on materials. The cross-organizational effort was executed by Sandia, Los Alamos National Laboratory and an external partner. • *1000, 4000, 8000, 9000, LANL*

CrossSim 3.0 simulator release

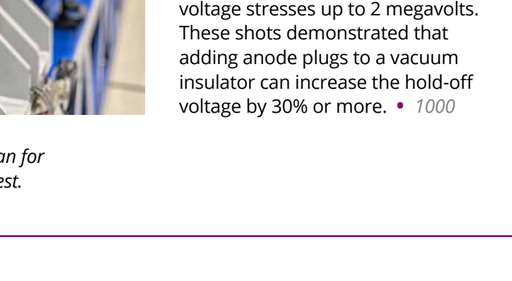
Sandia released a new version of CrossSim, an open-source simulator for analog linear-algebra accelerators developed at the Labs. This version includes a new interface making CrossSim drop-in compatible with existing Python and Matlab codes and allows simulations that are up to 40 times faster. The improvements significantly simplify the process of optimizing existing applications for analog hardware. Sandia already used the new CrossSim version to demonstrate the suitability of analog acceleration for quadratic optimization for autonomous navigation and guidance.
• *1000, 5000, 8000, LDRD*

Electromagnetic integration for W80-4 qualification

To complete W80-4 electromagnetic qualification, integration between testing, modeling and simulation required the development of a truncated-case surrogate model. Fused data from the model and from experiments helped to specify environments for future qualification tests. For the shielding effectiveness test, truncated-case model experience was applied to the full W80-4 geometry. Collaboration between the geometry, meshing and simulation teams resulted in a significantly more capable and efficient workflow of computer aided design to simulation. • *1000, 8000*

Machine learning for materials reliability

The Beyond Fingerprinting Grand Challenge Laboratory Directed Research and Development project is exploring the possibility of discovering robust materials and processes by semiautonomous platforms with embedded expert knowledge. The key development is Hierarchical MultiLayer Algorithms, a process optimization approach that includes high-throughput testing, multimodal data fusion, a patented physics-informed multimodal autoencoder, a new physics-based machine learning algorithm to accelerate materials simulations by 1,000 times and multiobjective Bayesian optimization. Sandia recently used Hierarchical MultiLayer Algorithms to accelerate development of production protocols for an additively manufactured Kovar alloy product.
• *1000, 5000, 7000, 8000, LDRD*



High-throughput tensile bar testing of Kovar samples is one component of multimodal data used to develop machine-learning models and process optimization within Hierarchical MultiLayer Algorithms.

Component-scale recovery on Z

A new capability at the Z Pulsed Power Facility forges a path for the use of a large, next-generation pulsed-power device in support of component qualification for stockpile stewardship. Sandia's new Non-Orthogonal Testing For Large-Area Threats tests and recovers component-scale objects subjected to warm X-ray insults and can support the fielding of nonnuclear components that are 50 times larger in area while maintaining isolation from debris and beryllium contamination. Sandia has tested and recovered such objects with active optical and electrical measurements for post-shot analysis. • *1000, LDRD*

Staff install hardware on Z machine to evaluate response of a test object to X-rays. Insets show details of the cassette providing protection from Z's environment.

Vacuum insulator development on Vulcan

A technologist inspects the vacuum insulator on the front of Vulcan for damage and signs of electrical breakdown after a 1.5 megavolt test.

High-voltage vacuum insulators are critical components in large pulsed-power machines such as the Z Pulsed Power Facility at Sandia. Vulcan, a testbed commissioned this year, is designed to push these vacuum insulators to their breakdown limit and learn how to take them even further. This past year, hundreds of experimental shots were conducted on various vacuum insulators at voltage stresses up to 2 megavolts. These shots demonstrated that adding anode plugs to a vacuum insulator can increase the hold-off voltage by 30% or more. • *1000*

New Saturn source tests materials

To expand the range of environments available to evaluate the performance of materials in extreme radiation environments, an electron beam source was commissioned that exposed 3D test objects to radiation at Sandia's Saturn pulsed-power machine. The large area and uniformity of this photon surrogate environment allows for full-scale materials response testing of components. This capability and successful testing of advanced materials developed at Sandia was the culmination of a multiyear collaboration with the Naval Research Laboratory. • *1000*

Radiographing instabilities on Z

Unstable deformation of materials at extreme conditions is challenging to model, even with the most advanced hydrodynamic codes. Sandia and Los Alamos national laboratories tested these codes using Z Pulsed Power Facility experiments to compress two nested beryllium cylinders. Machined grooves on the inner cylinder seeded dramatic instabilities at temperatures of thousands of degrees and pressures millions of times higher than the Earth's atmosphere. X-ray radiographs generated by Sandia's Z Beamlet Laser demonstrate the evolution of the instabilities over a few billionths of a second. • *1000, LANL*

End-to-end reentry flight assessment

The integration of novel computational simulation and ground testing capabilities provides a new capability for predicting aerodynamic and mechanical response and evaluating reentry system flight performance. Realistic simulations and tests will provide the environments needed by nuclear deterrence systems and components to design and develop qualification evidence earlier in the program and act as supplements later in the program. • *1000*

Sandia impacts Exascale Computing Project

Over the past decade, Sandia has been a leader in software technology for the multilab Exascale Computing Project. These software technologies enable the latest exascale supercomputers to run previously unsolvable national security analyses. Successful completion of the Exascale Computing Project was captured through key performance parameter points, and each Sandia software component successfully delivered on this critical metric. • *1000, 8000*

NATIONAL SECURITY

MESA team members manufacture semiconductor wafers under orange lighting to prevent light exposure of photoresist, similar to developing photography film in a dark room.

MESA ships more than 46,000 semiconductor parts

Microsystems Engineering, Science and Applications fabricated, packaged, tested and delivered more than 46,000 war reserve and qualification evaluation parts in fiscal year 2023, comprising 24 silicon application-specific integrated circuit deliveries, seven hyper-temporal sensor deliveries and 17 compound semiconductor deliveries, including the largest single MESA delivery to date of over 25,000 heterojunction bipolar transistors. MESA completed life-of-program delivery for the B61-12 and W88-Alt-370 programs. Sandia delivered an application-specific integrated circuit called Panther three months early, enabling use-flight tests a year before originally scheduled. • *5000*

MESA Extended Life Program

The Microsystems Engineering, Science and Applications Extended Life Program received dedicated NNSA investments to sustain MESA capabilities for the third year. Stakeholders from several divisions collaborated to successfully demonstrate program effectiveness, which helped to secure additional midyear funding to address safety and single point failure risks, and expedite future projects. Because of the program's success, MESA is sharing lessons learned with other areas to enable Labswide development of extended life program strategies. • *4000, 5000, 10000*

Cyber research for mission

Through a sponsor-funded research program, Sandia's cybersecurity team successfully delivered 60 technology transitions aligned to sponsor missions with contributions from multiple divisions. This sponsor-funded portfolio spans multiple cyber-research areas in hardware and software security, machine learning, artificial intelligence, mission analytics, computer and network security, mobile systems and human factors research. It comprises more than 20 projects across multiple centers. • *1000, 5000, 8000, 9000*

Threat Informed Mindset fundamentals

Working with the nuclear deterrence community and the Weapon Intern Program, the Threat Informed Programs team developed a training class, "Threat Informed Mindset," and incorporated it into the intern program curriculum. The training strengthens intern ties to nuclear deterrence experts and future leaders, extends threat awareness to the broader Labs community and influences organizational culture to consider design threats at a program's inception. • *5000*

Knowledge transfer across the DOE complex

Sandia's High Security Operations team has shared knowledge and experience with laboratories across the DOE complex. The National Renewable Energy Laboratory and Savannah River Site are establishing analogous High Security Operations processes and solicited Sandia's guidance to inform their designs. The High Security Operations team also paved the way for the National Renewable Energy Laboratory to understand how to build facilities to meet complex sets of requirements. Sandia helped their team submit required documentation and obtain approvals for building their first high-security facility. • *5000, 10000, NREL, SRS*

rFoil is installed on the walls of a new facility to meet complex building requirements.

Labs team leads AI risks training

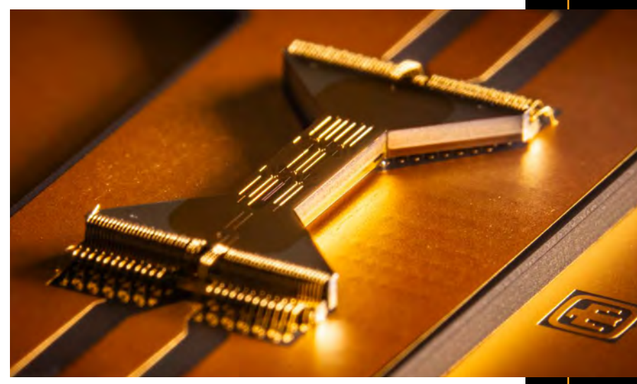
A cross-center team of Counter-Adversarial Machine Learning and cybersecurity researchers developed a methodology to assess the risks and vulnerabilities of artificial intelligence and machine learning systems, and applied it to several Sandia-developed systems. They provided an associated hands-on workshop to a multiorganization and sponsor working group. The audience learned about risk that AI and machine learning could pose to national security systems. The training is available for groups with security concerns for systems that include AI and machine-learning components. • *5000*

Securing critical firmware with HALucinator

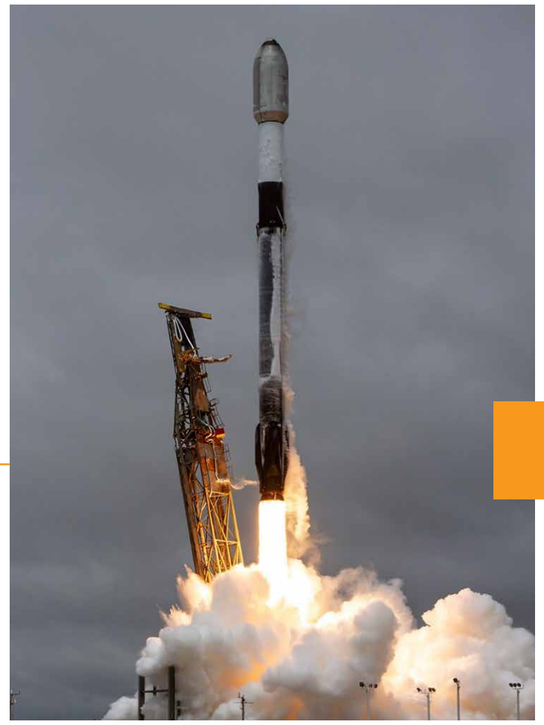
Sandia used HALucinator, a firmware emulation tool, to enable academic, industrial and U.S. government firmware emulation research; create the first full "firmware in the loop" cyber-physical simulations, removing the need for specialized, expensive hardware to understand the impact of cyberattacks on physical systems such as the electric grid; create automated vulnerability discovery techniques and accelerate development of security enhancements; and mitigate vulnerabilities in firmware, with applications for DOD and civilian systems. Purdue University, the University of California, Santa Barbara, and Sandia co-created HALucinator in 2018. • *5000, LDRD*

The Enchilada Trap

Sandia designed, fabricated and tested the Enchilada Trap to support quantum computing experiments with trapped ions. It was developed in collaboration with Duke University for the Quantum System Accelerator, a U.S. National Quantum Information Science Research Center funded by DOE. It uses more than 300 electrodes to trap and store up to 200 ions. The number of electrodes and capacity to store ions in the Enchilada Trap makes it one of the most sophisticated ion traps created for use in quantum computers. • *5000*



The Enchilada Trap, manufactured in the Microsystems Engineering, Science and Applications fabrication facility.



Special communications payload launches into space

The Drifter vehicle with a Sandia-developed advanced radio frequency communications payload on board launched from Vandenberg Space Force Base on the SpaceX Transporter-8 mission. A cross-division team that included Sandia's Advanced Special-Comms Systems group; Ground Station Development, Deployment and Data Analytics team; and Flight Edge Compute System Research and Development team successfully completed bus commissioning while overcoming anomalies. The payload is orbiting as a capability testing vehicle, demonstrating Drifter's special communications capabilities on a spaceborne platform. • *5000, 6000*

The Drifter vehicle with a Sandia-developed payload on board launched the SpaceX Transporter-8 mission out of Vandenberg Space Force Base.

Rocketeers continue to excel

Sandia's 60-plus-year legacy in successfully designing, building and flying rockets lives on after teams demonstrated numerous missile system and launch events at ranges across the country. Sponsors for the campaigns included the Missile Defense Agency, the Navy's Conventional Prompt Strike and the Army's Long Range Hypersonic Weapon programs. Sandia also is a key partner in the industry-led Multi-Service Advanced Capability Hypersonic Test Bed and High Operational Tempo programs, and conducted several sounding rocket tests to advance the nation's hypersonic capability. • *5000*

Staff in Sandia's Missile, Air and Space Defense group successfully launch a ballistic missile from the Pacific Missile Range Facility.

Accelerated decision-making for warfighters

Sandia teams deployed and supported integration of their flagship automated target recognition and automated precision geolocation tools in support of the U.S. Air Force Intelligence, Surveillance and Reconnaissance mission. Recent upgrades include an increase in the number of platforms and targets supported, a reduction in processing time, and a significant boost in target identification confidence and location accuracy to accelerate decision-making by warfighters to meet a broad and diverse set of operational needs. Several Sandia teams collaborated to develop these tools for national security missions. • *5000*

Real-time, GPS-independent navigation

Halcyon technology correlates radar measurements against local terrain relief maps to navigate an aircraft without the need for GPS. Sandia's Pointing, Navigation and Timing Resilience Group successfully demonstrated stable and accurate GPS-independent real-time navigation of an aircraft flight using Halcyon technology. The test concluded an intensive research and development sprint that used expertise across Sandia's Radio Frequency and Electronics Center, taking the technology from initial concept to demonstration in less than 18 months. • *5000*

Airborne radar data collected, verified

Raging Octopus, a government-funded project focused on gathering and analyzing airborne radar data, successfully collected maritime airborne radar data in collaboration with government partners during a crucial exercise to evaluate emerging technology. Data was collected to evaluate, analyze and compare flight test results with the Radar Analysis, Modeling, Simulation and Emulation Suite, a software suite that provides synthetic aperture radar. The software developed a radar model and simulated the airborne data to verify system performance. • *5000*

Left to right: Twin Otter Aircraft; Sandia local flight test location; maritime remote test site location.

Sandia team meets urgent national security need

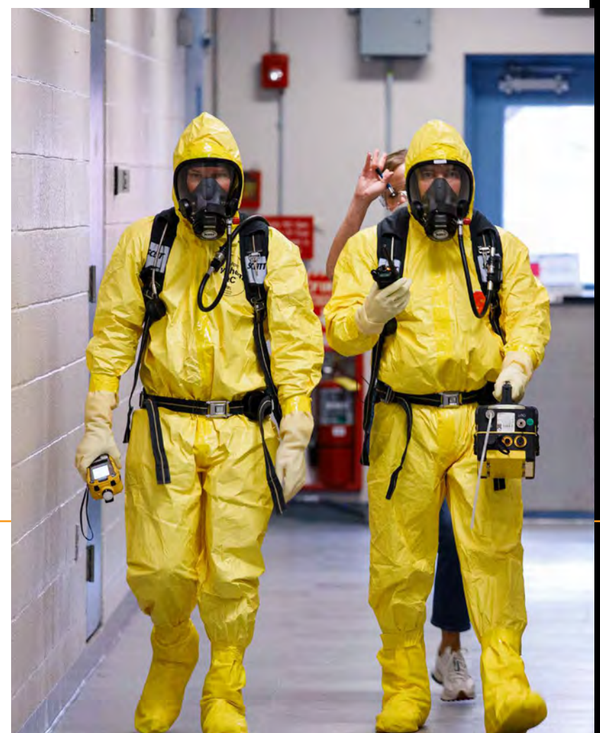
Sandia's Next-Generation Communications Solution group designed, prototyped and tested a radio frequency communications device designed to operate in extreme environments under severe size, weight and power constraints. The device was designed using state-of-the-art engineering methods, tools and commercial off-the-shelf components to meet an urgent national security need. • *5000*

Faster electronic mission device approvals

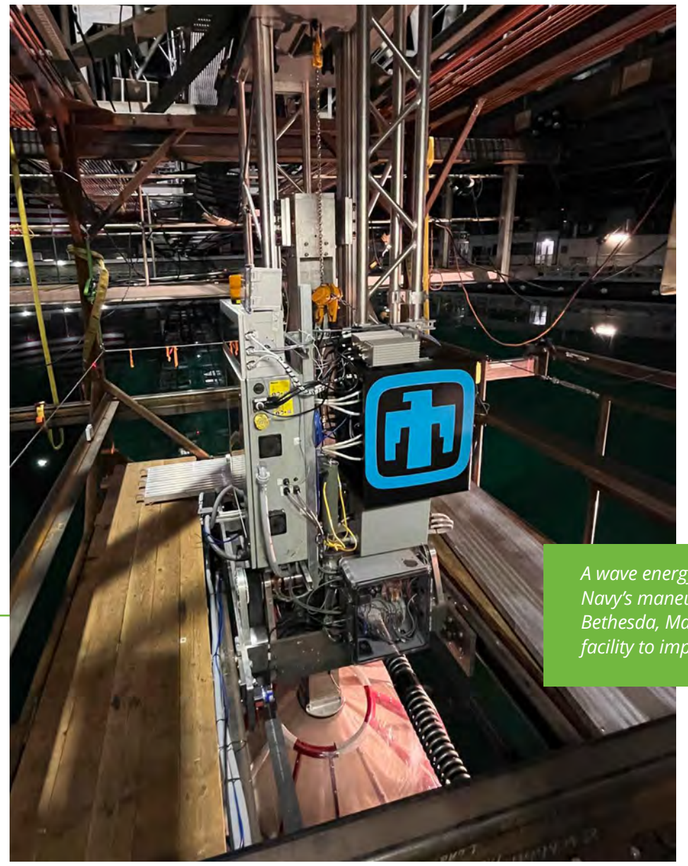
Sandia's High Security Operations team partnered with the DOE Office of Intelligence and Counterintelligence to gain local approval authority for electronic mission devices to come into high-security facilities to support Sandia's national security missions. The team now has authority to understand, mitigate and manage risks locally. This created efficiencies by drastically decreasing approval times, reducing DOE resources needed and increasing mission productivity on time-sensitive national security projects. • *5000*

MESA hosts full-scale emergency exercise

Sandia conducted a full-scale emergency response exercise at the Microsystems Engineering, Science and Applications Complex to evaluate the effectiveness of the Labs' response through implementation of the site's plans and procedures. The exercise involved 150 players and 80 observers with 105 objectives evaluated. The MESA Emergency Response Team participated and received acknowledgment for noteworthy practices. MESA personnel supported development of a realistic scenario while minimizing operational impacts and facility downtime. Emergency Management and the Emergency Response Team considered the exercise a success. • *3000, 4000, 5000*



ENERGY & HOMELAND **SECURITY**



A wave energy converter in the water at the U.S. Navy's maneuvering and seakeeping basin in Bethesda, Maryland. Sandia researchers used the facility to improve the energy converters.

Validating wave-to-wire model for wave energy converters

Sandia combined its expertise in hydrodynamics, mechatronics, dynamics and control, and systems engineering to significantly advance opportunities to use ocean waves for power generation by developing and validating a control system that optimizes performance of wave energy converters under variable conditions. The load-matching system, which uses a controllable magnetic resistance in place of a mechanical system, was integrated into Sandia's WaveBot platform and tested at the Navy's maneuvering and seakeeping basin. • *8000*

Untitled Goose Tool tracks hackers

Sandia programmers are helping the Cybersecurity and Infrastructure Security Agency through an innovative program that enlists Microsoft cloud users everywhere to track down hackers and cyberterrorists. Untitled Goose Tool was introduced to the public through a CISA alert in March. A Sandia cybersecurity team developed the free tool to track potentially malicious activity in Microsoft Azure, Azure Active Directory and Microsoft 365 environments. • *8000*

Simulations support decarbonizing energy infrastructure

Sandia updated the risk-assessment software MELCOR for use with new advanced nuclear reactors. The team demonstrated simulating accidents for advanced high-temperature gas-cooled reactor and sodium-cooled fast reactor concepts proposed by U.S. vendors. The successful deployment of these technologies will help decarbonize U.S. energy infrastructure and will require adequate mitigation of potential risks to public health and safety. The demonstration of MELCOR to simulate accidents enables advanced reactor deployment and demonstrates near-term readiness for Nuclear Regulatory Commission licensing. • *8000*

Next-gen baggage screening for TSA

Sandia is helping the Transportation Security Administration adopt open-architecture aviation security requirements that will allow it to respond to rapidly changing security threats. Sandia's transfer of software and hardware were milestones for TSA to move to the open-architecture screening platform. • *8000*

By modularizing security design with an open architecture, TSA won't have to add steps for travelers like removing shoes. (Photo by Andrea Starr, Pacific Northwest National Laboratory)

Report informs national regulations for nuclear launch activities

As commercial space launches increase and many propose including nuclear power and propulsion systems, Sandia identified potential issues and evaluated overlapping and conflicting roles of the agencies responsible for safety and regulation of such activity. Sandia's report led to the Labs' authorization to represent the DOE/NNSA Office of Nuclear Incident Response on the federal government's space nuclear splinter teams that are establishing interagency national regulations for space nuclear launch activities. • *1000, 8000*

WIPP cleans up defense-generated transuranic waste

Sandia's WIPP Performance Assessment and Decision Analysis Team successfully completed a planned-change request performance assessment of replacement panels. The assessment and analyses are a critical part of DOE's request to the Environmental Protection Agency for a change to the WIPP repository footprint. The team demonstrated that WIPP with the replacement panels will continue to comply with EPA's radioactive waste containment criteria. Approval of the change request aids DOE's continuing mission to clean up defense-generated transuranic waste from around the complex. • *8000*

$3.2M solar project at ABQ school

Sandia's Energy Storage Demonstrations program provided technical analysis, project support and $650,000 of DOE funding to Albuquerque Public Schools' largest solar-plus-storage installation (2,200 panels and a 2,884 kilowatt-hour battery). The $3.2 million project at Atrisco Heritage Academy High School will pay for itself after 13 years and will save the school district $3.5 million in electricity costs over its 25-year life. The solar-plus-storage installation at the southwest Albuquerque school also will enable the establishment of a community resilience hub for power emergencies. • *8000*

CLIMATE **SECURITY**

Sandia researcher Kenneth Armijo stands next to the industrial-scale Sandia Molten Salt Test Loop, the largest laboratory salt test loop in the world. (Photo courtesy of the UNM Alumni Association)

Molten-salt system could lower costs, raise power-plant efficiency

At its National Solar Thermal Test Facility, Sandia developed an advanced molten-salt system — operating at a record-setting temperature of 980 C (1,796 F) — to test and characterize alloys, coatings, ceramics and subcomponents for certain thermal energy storage systems. The milestone advances DOE goals to lower power-generating costs while increasing production for carbon-free concentrating solar power plants and small modular reactors. This required detailed evaluations of more than 100 materials, including refractory high-entropy alloys, for up to 1,300 hours. • *8000*

Navajo Nation partnership on energy transformation

Sandia led five technical assistance workshops with Navajo stakeholders to optimize a portfolio of energy resilience projects. Sponsored by the DOE Office of Indian Energy, Sandia led technical assistance, project management and proposal development with Navajo Nation project teams to support the nation's transition to a clean energy future. They identified 40 strategic projects with the highest potential for federal funding. The work extends from a December 2022 agreement signed by the Navajo Nation, DOE and the Department of Interior. Based on the effort, the Office of Indian Energy is using a similar approach for two other coal-impacted tribes. • *8000*

Arctic climate measurements improved

The Sandia-managed Atmospheric Radiation Measurement research facility on the North Slope of Alaska received several improvements that will expand DOE climate measurement capabilities. The upgrades include an extended field site located about 3.5 miles inland that measures coastal gradients of atmospheric variables, the commissioning of an improved hydrogen autosonde launcher for unmanned balloons that measure atmospheric vertical profiles, and the installation of a shelter for the deployment of a new aerosol and cloud lidar system. • *8000*

MISSION SERVICES

Optimizing ND project management

Modernizing the nation's nuclear deterrent takes strong project management. Sandia advanced its project management system in fiscal year 2023, creating a consistent framework that integrates technical and business teams and the myriad activities required for nuclear deterrence programs. The Labs also added comprehensive project management guidance for new programs, an independent cost and schedule review process, refined guidance for identifying knowledge points and gaps and a team focused on improving integrated project management across the nuclear security enterprise. • *10000*

A B61-0 mock unit used for training.

Sandia boosts regional, national economy

Sandia's contributions to the economy topped $4.6 billion in fiscal year 2023, supporting individuals, families and businesses at an unprecedented level. The spending included labor, subcontracts, purchases and other expenditures. This was a new record, surpassing the Labs' $4.2 billion in expenditures in fiscal year 2022. • *10000*

Zach Mikelson, small-business program manager, reports record economic impact.

Sandia strengthens supply chain

COVID-19, geopolitical events and more have rendered today's supply chains far more fragile. In the face of these challenges, Sandia overhauled its supply chain strategy to increase resilience. The Labs developed a playbook for anticipating and addressing possible supply chain disruptions, added supply chain analysts to proactively address and manage supply chain risks for key programs and implemented targeted supply-base and spend strategies, including the largest targeted market survey in its history to identify new suppliers and expand its supplier base. • *10000*

Estimating excellence

Sandia embarked on a multiyear effort to elevate its cost estimation approach, ensuring funding requests meet the needs of its national security mission. First-year improvements focused on enhancing competency and included streamlined institutional training and a more efficient cost-estimation process that reached more than 400 staff. Sandia also upgraded its independent cost estimation reviews for nuclear deterrence projects and added an outside reviewer for cost estimates on facilities projects, resulting in higher quality reviews consistent with best practice. • *10000*

Bot cuts check processing time

Sandia began using robotic process automation for expense reimbursement checks. This drastically reduced the time it takes to process and mail checks. The bot's automated processing of 1,265 checks takes about 36 minutes compared with the manual processing time of 63 hours and 15 minutes, a 99% improvement. Mailing checks takes about two minutes per week for the bot, compared to 10 hours of manual labor. • *10000*

Program develops future CFOs

Sandia built the Chief Financial Officer Position Rotational Program to develop a pipeline for CFO employees of the future. The three-year program rotates early career Sandians through three different finance and accounting positions. Participants benefit from supervision by talented managers, certified public accountants and expert staff and mentorship by senior members of the management team. The program drew overwhelming interest, with 99 applicants. • *10000*

Small-business use garners awards

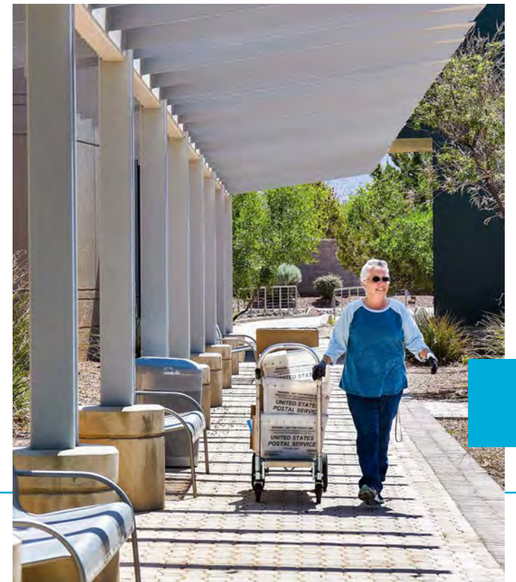
Sandia exceeded its small-business goals and was recognized by DOE's Office of Small and Disadvantaged Business Utilization with three awards. For the second consecutive year, Sandia's Mentor-Protégé Program was named Mentor of the Year. Sandia's Supply Chain Subcontract Manager Sofia Delgadillo-Marrufo was awarded Facility Management Contracting Officer of the Year, and Santa Fe-based Sandia subcontractor Wildflower International Ltd. won HUBZone Small Business of the Year. • *10000*

Strategic investments further mission

Through prudent financial management and reutilization of a financial credit, Sandia quickly deployed strategic investment funding. The funding led to enhanced capabilities and infrastructure sitewide with capital equipment, cross-functional software and other infrastructure that increased efficiency and effectiveness while addressing emergent national security needs. Deployment required rapid prioritization to identify investment opportunities, allocate resources, find sources for complex purchases and install hardware, software and capital items. The result was modernized information technology, mission computing and infrastructure. • *10000*

Revamp frees time for technical work

To support staff who do technical work as well as manage contracts for specialized equipment, materials and services needed for that work, Sandia revamped supply chain processes to save about 30% of their administrative time, which now can be devoted to difference-making technical work. • *10000*



Delivering for Sandia's mission

Sandia's mission as a Federally Funded Research and Development Center dedicated to national security requires an astounding amount of equipment, materials and supplies. The Labs supply chain team's role is to add qualified suppliers, procure what's needed and get it where it needs to go. In fiscal year 2023, the organization processed 13,057 shipments, an all-time record, and set post-pandemic records by handling 28,000-plus purchase requisitions and receiving and delivering 166,000-plus packages. • *10000*

Sandia processed more than 50,000 pounds of mail in fiscal year 2023. (Photo by Randy Montoya)

INFRASTRUCTURE OPERATIONS

A facilities manager catches up on work in one of the many shared spaces deployed during the COVID-19 pandemic.

New Mexico site set up for hybrid work

The hybrid work team achieved Labs milestone "Foster Sandia's culture transition to a long-term hybrid work model" by establishing new hybrid work environments and cultural norms. When over 850 individuals moved to home offices, on-site space opened for other program and organizational needs. The team reworked multiple policies, processes, success metrics, trainings and job aids, and transformed the work environment. The Strategic Capital Space Plan was accomplished through the completion of two collaboration centers, as well as a new resource center in the Innovation Parkway Office Center to assist the hybrid work community. • *4000*

Delivering construction projects for mission success

Facilities completed 1,969 construction projects at an estimated total project cost of $215 million to support mission work and meet NNSA objectives. The teams completed the projects safely with a recordable safety case rate of 0.31, significantly lower than the Labs' goal of 0.7. • *4000*

Team finishes alarm system conversion ahead of schedule

The California Site Security Systems team exercised creative thought, team building, full accountability and commitment to complete the OnGuard conversion project six weeks early and within budget. The access control and alarm systems conversion faced several challenges, including hardware that was difficult to buy. • *8000*

Safety Culture Academy recognized as a best practice across DOE

Sandia showed continued commitment to a safe and inclusive work environment by developing and implementing the Safety Culture Academy training program, which streamlined safety performance objectives, success measurements, the commitments tool and the ES&H event management process. The academy focused on teaching participants how to establish and maintain a safety culture to create productive and safe working environments. • *4000*

A biologist from the Ecology Program holds a western long-nosed snake captured during routine reptile and amphibian monitoring at the Sandia field site in the sagebrush habitat.

CREST project awarded subcontracts

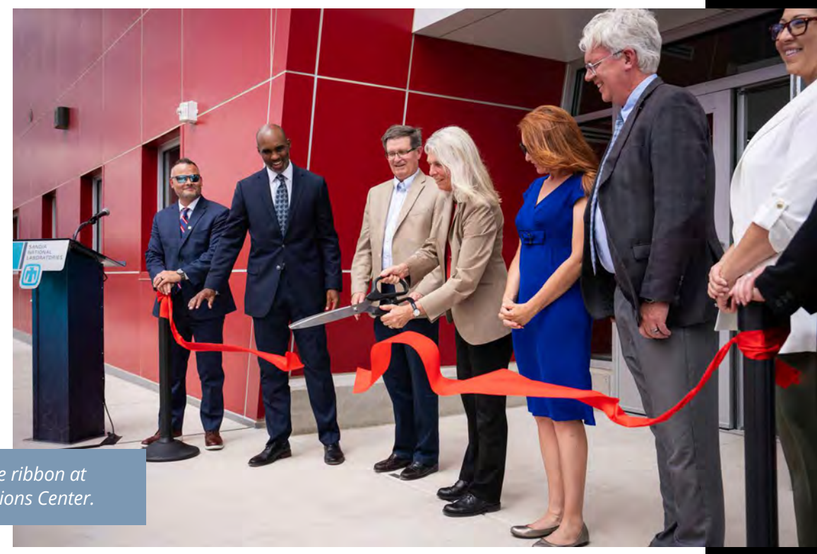
The Combined Radiation Environment for Survivability Testing project made progress toward critical decision approval by awarding subcontracts for the Nuclear Facility and Central Utilities-Building Alarm Station conceptual design, reactor conceptual design, Office Light Lab final design and issuance of the accelerator conceptual design request for quotation. The team evaluated a campus approach delivery, aligning scope into numerous smaller packages for critical decision approval, balancing funding availability with incrementally delivering value and mitigating risks associated with the aging Annular Core Research Reactor facility. • *1000, 4000, 10000*

Developing an environmental impact statement

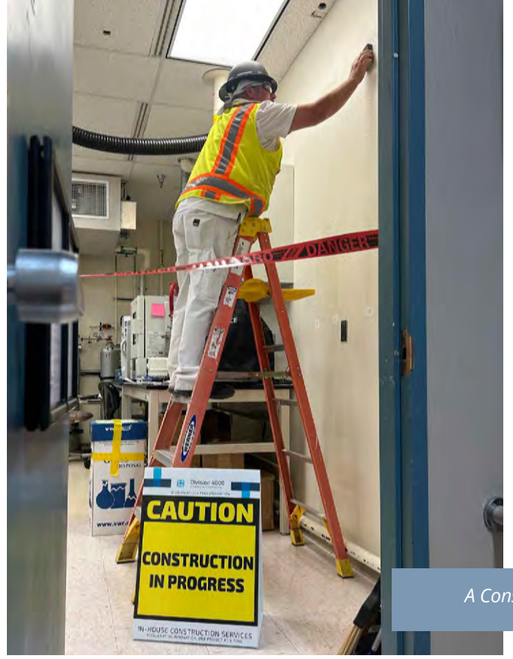
Sandia continues to develop a new version of its Site-Wide Environmental Impact Statement, which is on schedule for completion by fiscal year 2026. The statement will be used to analyze environmental impacts of proposed facilities and operations through 2041. The Labs completed fiscal year 2023 milestones, including stakeholder meetings with the Pueblo of Isleta, Kirtland Air Force Base and the U.S. Forest Service; public scoping meetings; data collection and delivery on mission programs, planned facilities, waste, ecology and utility forecasting; and review of early chapters. • *4000*

Emergency Operations Center completed

A new, state-of-the-art Emergency Operations Center was completed within cost, scope and schedule in accordance with an NNSA-approved pilot approach. The new facility will help responders protect the workforce and be prepared to deal with a variety of hazards and threats. The 25,000-square-foot building is dedicated to incident management and response using enhanced equipment, technology and other tools to support Sandia's mission 24/7. • *4000*



NNSA Administrator Jill Hruby cuts the ribbon at the opening of the Emergency Operations Center.



A Construction Services team member performs work safely.

DAT initiative completes phase one

The Division Agility Transformation initiative provides agile and timely infrastructure services to meet mission needs. Infrastructure Operations established the Facilities Design and Engineering center and Construction Services organization to design and construct in-house projects. Five new construction trade job descriptions were created under the existing collective bargaining agreement. Sandia purchased $4 million in construction equipment to support operations, and the architecture and engineering design team started new projects. The Construction Services team worked with Kirtland Air Force Base to approve design of a construction laydown yard to enhance security and appearance at the Eubank gate. • *4000*

Sandia California continues recap program

Sandia California continued its robust recapitalization program, with $53 million of work executed in fiscal year 2023. The projects enhanced capacity and new capabilities, replaced aging assets and significantly improved infrastructure. Many projects met specific efficiency and energy-saving requirements. The upgrades are crucial to meet current and future mission demands, support plans for continuous evolution and workforce needs and reduce the site's energy consumption. • *8000*

Providing career opportunities to youth

Infrastructure Operations partnered with large organizations in New Mexico such as Meta, Intel, Associated Builders and Contractors and the Associated General Contractors associations to develop a pipeline of opportunities for young people to consider careers in the construction industry. New Mexico faces labor shortages to meet construction and facilities project demands, so Sandia is collaborating with those organizations and the community to promote jobs through career fairs, develop creative solutions to integrate curriculum into public schools and create greater awareness of opportunities available through careers in the trades. • *4000*

ES&H focuses on Labswide partnerships

Partnerships across divisions led to the success of a hazardous machining activity that never had been attempted at the Labs. A test unit containing explosive, radioactive and toxic material was part of a drop-tower test with recovery of key components, which provided critical data for the next steps in the development of a nuclear deterrence modernization program. The multidisciplinary team included System Environmental Qual Test, Modernization Hardware and Assembly, Explosive Testing Fab and Ops, Radiography, Mechanical Measurements, Mechanical Design, Radiation Protection, Explosives Safety and Industrial Hygiene. • *4000*

Macroencapsulation process for low-level waste.

Safe and efficient radioactive waste management

The Facilities Waste Management and Pollution Prevention team delivered effective, safe and secure management of accountable radioactive and classified waste by converting a storage building to a vault-type room at the Radioactive and Mixed Waste Management Facility. The vault-type room provides greater security and operational agility during treatment and shipment operations. The team also participated in a successful audit of the Nevada National Security Site Radioactive Waste Assessment Program, with no findings. • *4000*

EXECUTIVE SUPPORT CENTER

Labs Director James Peery, center, speaks along with Deputy Labs Directors Laura McGill and David Gibson at a Sept. 6 town hall that unveiled Sandia's two big goals to the workforce.

Labs sets two big goals

Sandia took a new approach to strategy that empowers each staff member to help achieve the Labs' mission. The leadership team honed two big goals — accelerate innovation and lead in modern engineering — and communicated them during a Labswide town hall. Attendees appreciated this clear and practical direction. "It is great to have unifying goals that the majority can relate to and work toward," said Sylvia Saltzstein, a senior manager in integrated security solutions who attended the event. • *ESG*

Podcast steps up employee communications

Team members record an episode of the Inside Sandia Podcast.

The Labs launched a biweekly podcast that celebrates accomplishments and connects employees with colleagues and the purpose, mission and vision of the Labs. The new audio-only medium accommodates diverse learning styles and makes Labs communications channels more accessible. The debut episode featured the researcher behind the use of solar power to roast green chile, how it fared in a taste test and implications of the technology for industry and the environment. It was played more than 1,000 times. • *ESG*

Labswide effort successfully targets red tape

Inspired by NNSA's Enhance Mission Delivery Initiative, Sandia launched Unleash Excellence to boost employee morale and strengthen commitment to mission by reducing the red tape that stifles innovation. Unleash Excellence is built on critical thought, intelligent risk-taking and a spirit of experimentation to empower a more adaptable and responsive workplace. Thirty-five projects were completed, saving $10 million and 45,000 labor hours annually. • *ESG, 9000*

INFORMATION & SECURITY ENGINEERING

New classified cloud service

NNSA selected Sandia as the lead laboratory to design, implement and operate the NNSA Secret Cloud Network, a new classified cloud service. The initiative is a revolutionary opportunity for DOE and NNSA sites as it offers a single shared cloud environment that provides enterprise-wide services for email and collaboration to all users connected to the classified network. Sandia is partnering across the nuclear security enterprise and working through the discovery and design phase to deploy the network across all sites. • *9000*

Sandia deploys creative CUI solutions

Controlled Unclassified Information rules are more complex than Official Use Only rules, and OUO categories don't map neatly to CUI. To help with the transition, Information Technology deployed several creative solutions, including a CUI Liaisons program, a dedicated resource for answering CUI questions and the CUI Marking Assistant, a point-and-click tool that develops CUI markings. The OUO-to-CUI crosswalk and CUI website provide additional job aids, and the team maintains an email entity to answer user questions as they arise. • *9000*

IT innovates to unleash excellence

To help Sandia capture ideas and innovate through the Unleash Excellence Initiative, Information Technology released ServiceNow's crowdsourcing tool in the Idea Management module before all other ServiceNow solutions. Drawing on crowdsourcing for ways to reduce red tape, the Unleash Excellence Initiative engages and encourages workers to submit ideas, which are voted up or down by others, and vetted by center and division representatives for feasibility of implementation. Since its release in May, Sandia's innovative workforce has generated over 500 ideas. Iterative improvements to the tool have enabled the team to more efficiently analyze and communicate new ideas. • *9000*

Digital engineering enterprise collaboration

In collaboration with partners across Sandia and other nuclear security enterprise sites, the Product Realization Integrated Digital Enterprise program launched systems for enabling digital engineering at the Labs and other sites. The program produced an Enterprise Requirements Management System to enable such efficient cross-site requirements as collaboration and traceability to support weapons programs. The team is working on an enterprise-wide Digital Thread aimed at accelerating weapons product realization, increasing agility and responding to rapidly emerging threats. • *9000*

Technical security system upgrades

Security teams in New Mexico and California completed a comprehensive three-year project to upgrade security access control and alarm systems. The new intrusion detection system provides state-of-the-art alarm monitoring and more efficient, robust tools for data collection and system management. Additionally, more than 1,500 badge readers across the Labs were replaced with newer technology that provides more reliable performance and proactive life-cycle management. • *9000*

Sandia meets security performance goal

Sandia met a significant security performance goal to track the rate of Category A Incidents of Security Concern against labor hours. Through strong partnerships between the Security organization and Cybersecurity, Information Technology and mission organizations, Sandia met the goal set by Labs leadership in fiscal year 2021 and then surpassed it, achieving a significant 50% reduction in the targeted rate metric. Efforts that contributed to the success included improvements to the processes and tools associated with causal analyses and corrective actions, expanded venues for sharing classified lessons learned and enhanced training. • *9000*

HPC partnering boosts performance

The High-Performance Computing Systems team partnered across Sandia to combine three HPC Transformational Investment Wedge requests. The Flight cluster will enable Sandia's climate-computing program to support enhanced climate modeling and analysis and will provide mission organizations the ability to acquire dedicated computational resources. The new units also will provide institutional graphics processing unit cycles to HPC and HPC artificial intelligence and machine learning workloads. • *9000*

Scalable Transformational Investment Wedge-funded HPC cluster Flight includes climate studies and condo systems.

HUMAN RESOURCES
& HEALTH SERVICES

An Environment, Safety and Health coordinator, right, reviews a resume and offers suggestions to a postdoc during Careerapalooza.

Prioritizing growth and career development

Many Sandians want more opportunities to develop skills and expand their careers. To that end, Sandia created new events such as Careerapalooza and Division Spark Spotlights and established a new Career Development Office, giving staff greater insight into the work performed in other areas of the Labs and more access to tools and resources. About 7,600 employees attended Spark Spotlight or Careerapalooza events in fiscal year 2023. Employee participation in university education programs also increased to 76.6%. • *3000*

Making Sandia's pay more competitive

By collaborating with NNSA to make the Labs' pay more competitive compared to the market, Sandia has been able to increase starting salaries and funding for sign-on and retention programs, strengthening the Labs' ability to attract and retain critical talent. Sandia also has been able to increase funding for promotions, pay adjustments and variable pay, known as bonuses in industry, leading to strong year-over-year pay increases and more professional advancement opportunities. • *3000*

Enhancing employee health and well-being

Sandia demonstrated its focus on the health and well-being of its employees by implementing a direct scheduling phone line for the Employee Assistance Program. The direct line gives employees and managers more immediate contact with a program professional and allows representatives to respond faster to client needs. The program is also piloting a Well-Being and Resilience Practices training program that focuses on values clarification, stress management and increasing creativity. The program combats a common employee fallacy that they don't have time to take care of themselves. • *3000*

Delivering more flexible benefit options

Labs leadership continues to listen to feedback about benefits from employees, who say they value choice, time off and more flexibility and support for child care. Sandia has continued to seek ways to enhance the benefits it provides, introducing more flexible options in fiscal year 2023, like a new lifestyle spending account, additional dental and vision plan options and eliminating the $100 minimum contribution to the Health Savings Account. More new and enhanced benefits are on the way in 2024. • *3000*

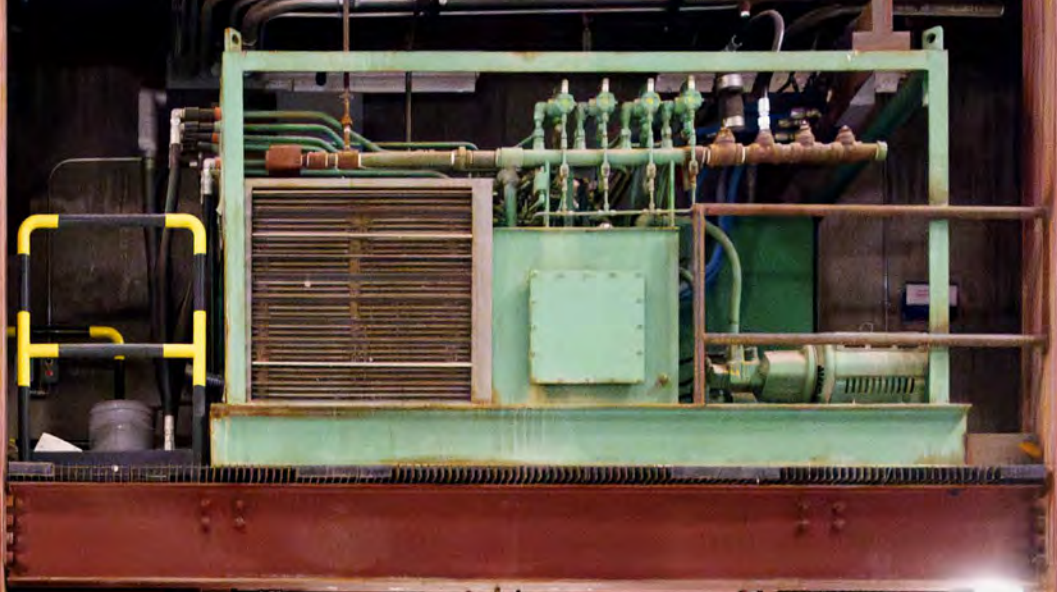
Expanding hiring and outreach efforts

Sandia equipped new technical recruiters to find top talent in their fields using an enriched hiring strategy. The new strategy increases the Labs' competitive advantage in the labor market and reduces the burden for hiring managers by shortening the time it takes to find and hire qualified candidates. Sandia also remains committed to expanding its outreach for veterans and individuals with disabilities, creating a diverse pool of talent and strengthening a culture of belonging and innovation. This effort resulted in several national awards, such as Forbes' 2023 America's Best Large Employers and Best Employers for Diversity, a 2023 Best Place to Work for Disability Inclusion from DisabilityIN and a 2023 HIRE Vets Gold Medallion Award from the Department of Labor. • *3000*

Building a culture of recognition

The power source capabilities project team accepts the Lab Director's Award at the New Mexico ERA luncheon.

Sandia is on a multiyear journey to make the Labs a better place to work, and a key part of that is having a strong culture of recognition. The Labs continues to enhance its rewards and recognition programs, resulting in 975 Employee Recognition Award nominations, 684 gift cards distributed by managers for jobs well done, a 52% increase in peer-to-peer recognition through Sandia's Thunderbird Kudos program and 792 employees receiving one- and three-year service anniversary awards for the first time. • *3000*




EXIT


MIN
SURGE TANK ISOLATION VALVE
FIRE DOOR KEEP CLOSED