NEVADA NATIONAL NNSS SECURITY SITE

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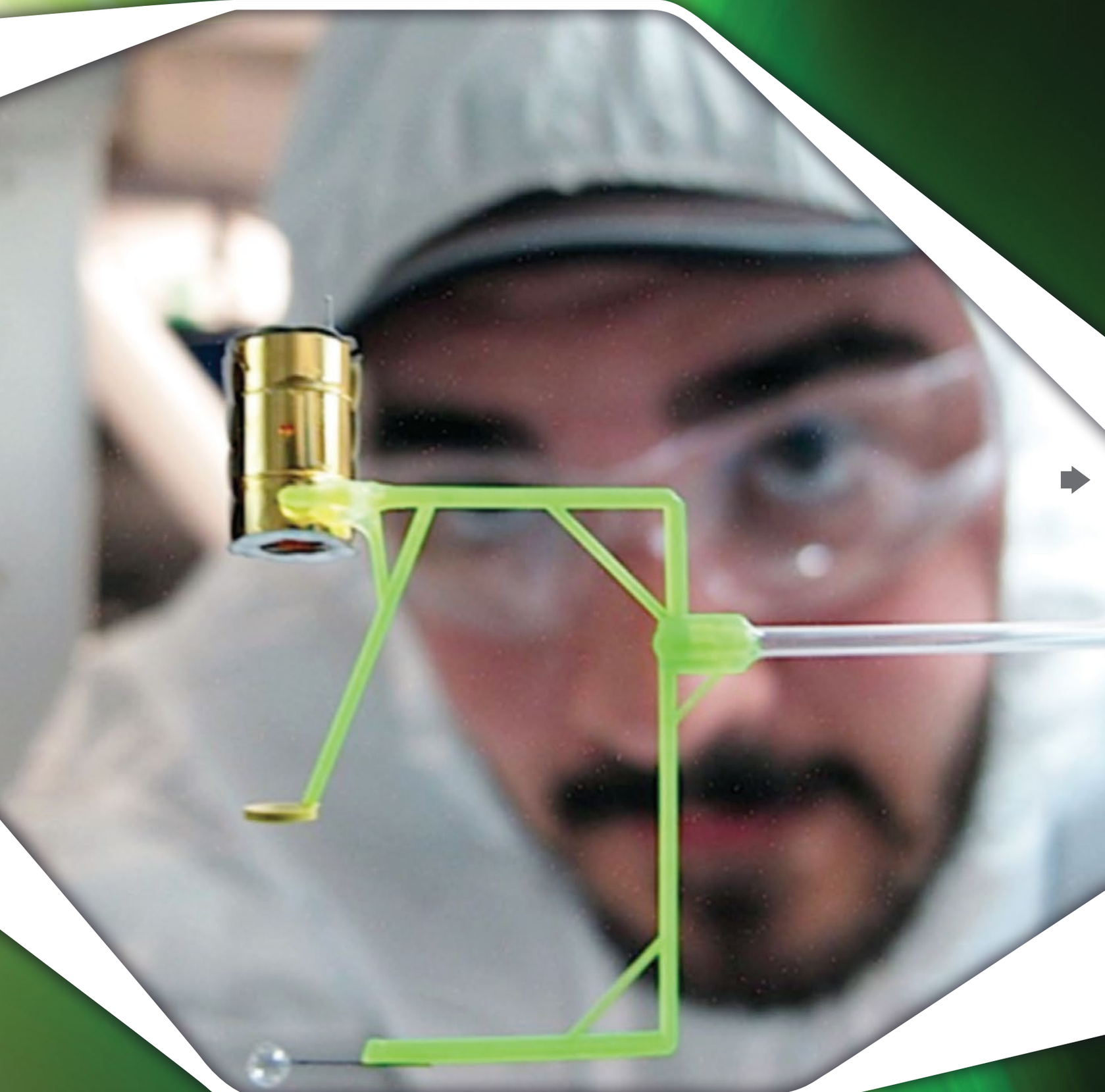

A Look at the Accomplishments of the Nevada National Security Site for 2016

"Virtually everything of consequence that occurs in the nuclear security enterprise comes to or otherwise relies on the facilities and expertise at this site."

- Frank Klotz, NNSA Administrator

MESSAGE FROM STEVE LAWRENCE AND JIM HOLT

The year 2016 came to a close with so many remarkable successes. We see an even busier, more productive time for the Nevada Enterprise in 2017.

This year the Nevada National Security Site (NNSS) met every national milestone and conducted successful work in every one of our programmatic areas. The Joint Actinide Source Physics Experimental Research (JASPER) facility conducted important materials research and our underground experimental laboratory, U1a, moved forward with infrastructure improvements and experimental planning for the next generation of experiments supporting National Nuclear Security Administration (NNSA)'s Stockpile Stewardship program.

Global Security's Source Physics Experiments (SPE-5 & 6) provided invaluable data to further our capability to support nonproliferation activities worldwide.

We hosted the Comprehensive Test Ban Treaty Organization's (CTBTO) international on-site inspectors in 2016. These international inspectors are trained to observe and detect possible clandestine nuclear explosive tests. At our T-1 facility, we have trained more than 190,000 U.S. first responders. These medical, police, and fire department responders are trained to deal with radiological emergencies and in 2016, we began to train international first responders. Through these two examples, we are seeing the value of our unique site and the capabilities of our people to support both U.S. and international organizations.

We own our past and our future. Together we will continue to grow the NNSS as the site of choice for innovation in science and engineering for national security.

Steven J. Lawrence

Steven J. Lawrence
Manager,
National Nuclear Security Administration Nevada Field Office

James Holt

James Holt
President,
National Security Technologies, LLC

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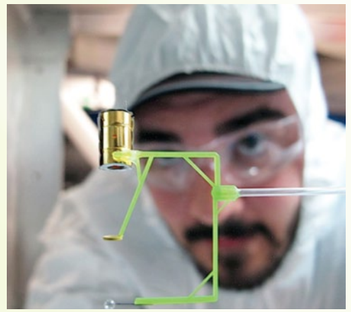
CUTTING EDGE

NNSS scientists at Livermore spearhead first Opacity shot at NIF.



CLOSING TIME

Environmental Management completes remediation of 1963 test site.

NEW DIMENSIONS

3-D technology adds something extra to mission.

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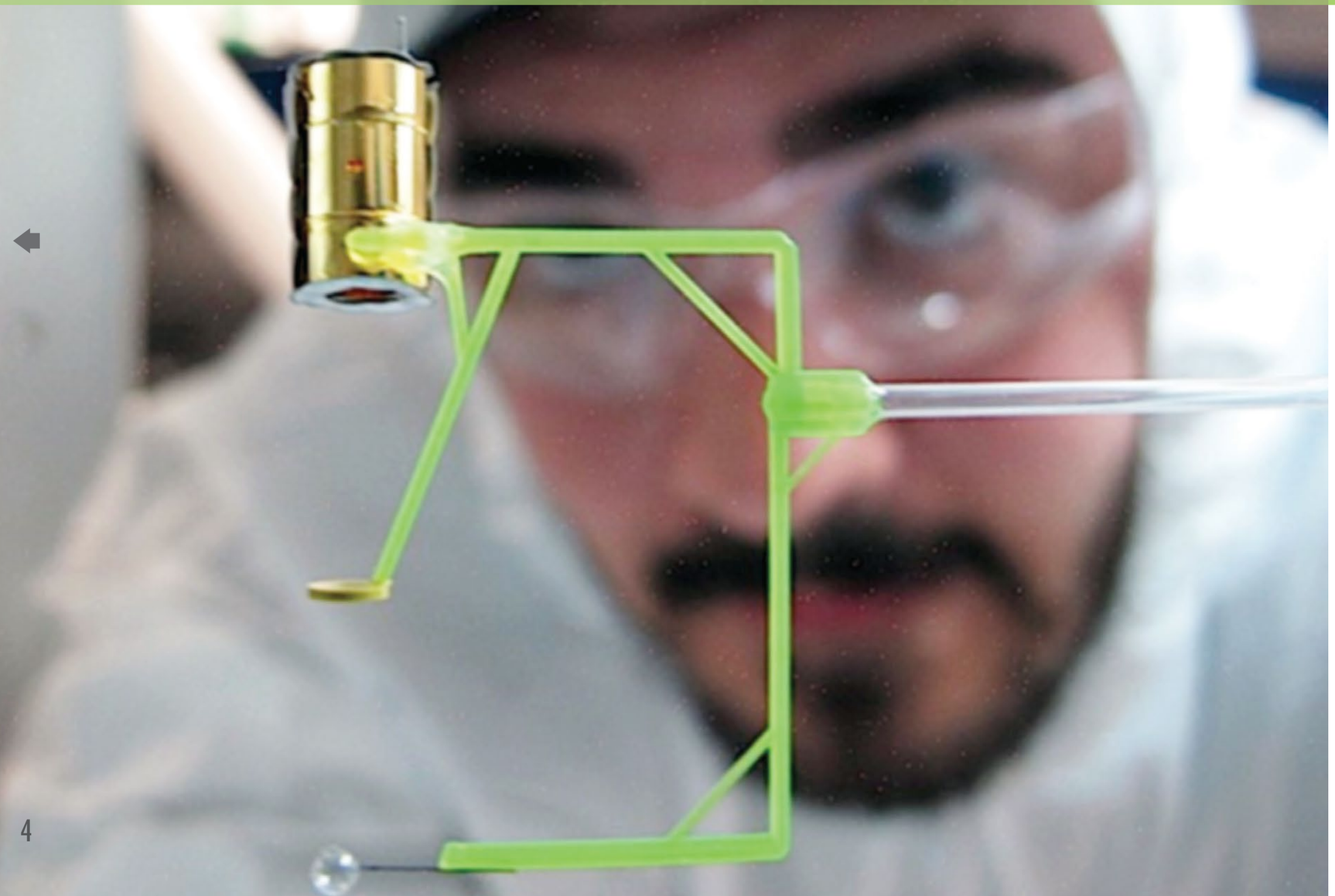
NNSS Scientists Bring EXPERTISE to Opacity Project



Nevada National Security Site (NNSS) scientists completed building, qualifying and preparing new Opacity Spectrometers, which were included in the first-ever Opacity shot at the National Ignition Facility (NIF) in September. Opacity is the degree to which a substance is opaque to radiation – such as light and X-rays – and is a key parameter in understanding the properties of weapon-related materials under extreme states. Such sophisticated science is essential to the NNSS mission to help keep the nation's nuclear weapons stockpile safe, secure and effective.

The NNSS team fielded the Opacity Spectrometer, or OpSpec, devices as part of a five-laboratory collaboration established in 2015 between Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), NNSS, Sandia National Laboratories (SNL) and the Laboratory for Laser Energetics (LLE) in Rochester.

Developing an opacity platform at the NIF in Livermore, Calif. was aimed at independently verifying ongoing opacity measurements performed at the Z-Facility at SNL.

NIF is the world's largest and most energetic laser facility ever built. It's also the most precise and reproducible laser as well as the largest optical instrument. By focusing NIF's laser beams onto a variety of targets, scientists create extreme states of matter, including temperatures of more than 180 million degrees Fahrenheit and pressures that exceed 100 billion times Earth's atmosphere. It is the only facility that can create the extreme conditions that are relevant to understanding the operation of modern nuclear weapons.

The Opacity Spectrometer shot in September further refined that process. Previous opacity measurements disagree with current models, and NIF is the best facility to attempt to reproduce the results. OpSpec collected the first data set on the NIF using the fully integrated opacity platform. The data return was a key deliverable for completion of the 2016 High-Z Opacity Assessment milestone.

In the experiment, iron samples were heated with X-rays from a laser-heated metal cylinder (hohlraum) to bring the sample to the density and temperature achieved at the Sandia Z-Facility. A separate backlighting X-ray flash was generated by a laser heated plastic capsule, which is used to record an absorption spectrum through the sample onto an X-ray spectrometer.

The NNSS scientists also are involved in opacity platform development shot support and data analysis. The team helped to design, develop and understand the broadband X-ray backlighter source. In addition, they provide broadband soft X-ray spectrometer data analysis, vital to determining the temperature of the hohlraum and sample, along with analysis of data collected with X-ray spectrometers and imagers that provide information on the X-ray source size, duration and brightness.

Diverse Team Supports Silverleaf Experimental Series

The Silverleaf Experimental Series was conducted in 2016 to validate the experimental design and diagnostic instrumentation for the upcoming Red Sage subcritical experiment series scheduled for the NNSS. The series is part of the NNSS's ongoing mission to ensure that the nation's nuclear weapons stockpile remains safe, secure and effective.

The Red Sage campaign is designed to measure the amount of material thrown out from explosive shock on metal surfaces (plutonium) over a range of conditions. The goal is to observe and assess the material in conditions that simulate a nuclear weapon detonation. These results will be used to better refine physics models of material properties under dynamic shock conditions.

The Silverleaf series of four experiments were executed at LLNL in July and August 2016. The Red Sage experiments will be staged underground in U1a at the NNSS in 2019.

The experiment and diagnostics were fielded by a team from LANL, LLNL and the NNSS. A large number of diagnostics were employed, including three new diagnostics: multi-frame soft radiography, broadband laser ranging, and the third generation of the Multiplexed Photonic Doppler Velocimetry System.

Multi-frame soft radiography records a sequence of images of the cloud of nuclear particles ejected by the explosive shock to measure the particles' evolution and density over time. Based on this successful deployment, this diagnostic has been selected to be the primary diagnostic for the Red Sage experiment.

A special feature and primary focus of the Red Sage experimental series is employing multi-frame, soft X-ray radiography into a vessel experiment. This required development of multi-pulse flash X-ray diode head, an appropriate scintillator to convert X-rays to visible light, an optical image relay system to collect and focus the image, and a multi-frame digital camera to record the images – all working together in an integrated fashion. NNSS engineers, techs, and scientists worked with their national laboratory colleagues to develop and field a complete radiographic system capable of collecting high fidelity radiographs of low-density ejected materials.

Such sophisticated science is a hallmark of experimental work at the NNSS.

A full return of quality data was achieved with increasing fidelity as each experiment progressed. NNSS scientists provided specialized analysis to evaluate the large volume of data to help planning between shots. The analysis process provided accurate, consistent, and a rapid turnaround that can't be done outside NNSS. The results validated the feasibility of executing the Red Sage series as designed.

The team was extremely successful in project execution, acquiring and comparing multiple diagnostics on the series of explosive tests.

Workers perform X-ray source and radiographic imaging system alignment for testing in laboratory in preparation for field deployment.

A technician sets up an X-ray source and scintillator image convertor in preparation for imaging.

EMPLOYEE PROFILE

Lauren Patrick

Mining and construction are both high-risk operations and safety is paramount. For Lauren Patrick, keeping those operations safe at the NNSS is her mission, even if that work is nearly 1,000 feet below ground.

Patrick is the Safety Specialist for the NNSS U1a Complex, where some of the most complex scientific work at the NNSS is conducted underground. Scientists use the U1a Complex to conduct subcritical experiments as part of the Stockpile Stewardship program.

The experiments are vital to the NNSS mission, but equally as important is ensuring the safety of the employees who work there.

"As a Safety Specialist, I get involved in all work that's conducted at the complex to ensure that we're complying with safety standards and company directives," Patrick says. "I work with the crews to ensure that the work is planned in a safe manner and that employees have the appropriate resources to carry out their work practices."

She also serves as part of the NNSS Mine Rescue Team, a multi-disciplinary group that trains to rescue workers in the event that there is ever a major incident at the complex.

Patrick got into the field in college where she met several people who worked in safety. "They seemed to really enjoy what they were doing and I was attracted to that. I was fortunate to attend a university that offered a degree in Safety Science."

STEREOGRAPHIC IMAGING

Ushers in New Generation of Stockpile Science

"A picture tells a thousand words"—this is a concept that captivates everyone, from the casual observer to the experimental scientist. To bring this concept to life, scientists at the NNSS have developed a new diagnostic imaging tool to investigate the behavior of nuclear materials under high-explosive dynamic shock conditions.

The newly created dynamic stereo surface imaging (DSSI) capability will aid in future nuclear weapons stockpile science projects. The DSSI records a high-speed image sequence that allows scientists to peer inside an imploding nuclear experiment with stereoscopic imaging. It provides visible images of the shocked surface to supplement radiography and velocimetry data recorded during the experiments. This furthers the scientists' understanding of the conditions that are relevant to the operation of modern nuclear weapons.

"DSSI has evolved over several years and will be deployed in future experiments, including the Lyra series Eurydice (March 2017) and Vega (Dec 2017)," said Dr. Steven Goldstein, manager, Mission and Projects Division for Defense Experimentation and Stockpile Stewardship.

Recent advances in fiber-optic probe capabilities have made it possible to integrate the DSSI into the diagnostic packages for subcritical experiments. For example, the original flash lamp strobe illumination system has been replaced with a multi-pulse laser system to illuminate the frame exposures.

The DSSI projects a bright image through a very small hole, which is no small task. During a prior experiment, scientists were able to use a small probe to achieve this. For upcoming experiments, the method will be expanded to stereo imaging by the addition of another small probe and small optical wedges to make the two views overlap.

For each view, a small lens focuses light from the surface to a small-diameter long imaging rod. An optical relay directs the image out of the experimental package, for transmission to cameras outside the high-explosive confinement vessel. Stereo correlation is then used to combine the two views.

Stereo correlation is the process of recovering information contained in the 3-D imaging space from stereo camera images, by quantifying the relationship between multiple images and orientation of a calibration target such as a checkerboard or dot pattern. Using these properties, a 3-D visualization of the scene can be produced. A 3-D movie can then be created, allowing for a unique perspective of the experiment.

A scientist examines resolution test images.

Experiment LAUNCHES Scientists & Engineers into Careers in National Security

Aspiring science, technology and engineering workers are learning how to use complex technologies at the NNSS North Las Vegas complex, acquiring skills that could ultimately pave the way for their careers supporting national security in materials characterization under dynamic conditions.

The training is taking place on a new small gas-driven launcher that serves as a platform for experiments to study the effects of shock wave compression on different materials.

"One of the main goals is to train would-be scientists, engineers and technicians on the use of this technology," said Dr. Sarah Thomas, a post-doctoral scientist who works for the NNSS. "It's a great opportunity for them to advance their careers and perhaps work at the Nevada National Security Site."

"The launcher basically launches a projectile down its barrel into a target," Thomas said. "We are training these folks on the operation of the launcher and, at the same time, capturing as much scientific data as possible on how the target material reacts at the time of impact. The data recovery supports our national security mission."

The experiments at the North Las Vegas facility are similar to the experiments conducted at the Joint Actinide Shock Physics Experimental Research (JASPER) facility at the NNSS, but on a much smaller scale. And, it's important to note, the launcher experiments do not involve nuclear material, but rather examine the shock compression properties of benign materials, such as iron, that have similar physical properties to nuclear materials.

She noted that a similar gas gun is also being used at the University of Nevada, Las Vegas (UNLV) for training of university students and various other scientific and technological endeavors.

Despite the fact that the launcher is smaller than JASPER, and nuclear materials are never used in it, the launcher experiments do provide the scientists at the NNSS and the national laboratories with valuable data and some unique experimental opportunities that support the national security mission.

For example, the launcher will allow for timely, cost-effective development of new diagnostics for experiments conducted by the National Laboratories in support of the nation's nuclear weapons program. It will also enable continuing development of velocity interferometers, which have revolutionized the volume and quality of data collected during subcritical experiments at the underground U1a complex at the NNSS.

Because of the large bore of the launcher, 75 mm or about 3 inches, scientists will be able to work on new experimental techniques using relatively longer timeframes for shock-wave compression experiments at lower pressures.

The launcher is approximately 20 feet long, and its current maximum projectile velocity is 500 meters per second. So far, three early-career staff members have been trained on the launcher by teaming them with seasoned mentors in shock physics, diagnostic development, data capture, and experiment platform development/ operations.

The facility design, experiment execution, and diagnostics team successfully executed the first Dynamic Science Launcher experiment.

JASPER HELPS TO IMPROVE QUALITY DATA

The JASPER facility at the NNSS had an exceptional year in 2016, and more successes are expected in 2017 that will further support the nation's nuclear weapons Stockpile Stewardship Program.

Scientists from the national laboratories use JASPER to conduct experiments, or "shots," that subject materials, including special nuclear materials, to extreme pressures and temperatures to see how they react. The data is used to assess the performance of the nation's nuclear weapons stockpile.

The ability to turn around numerous experiments in the same year, and the level of data derived from the work, have helped to enhance the facility's reputation as a premiere experimental location.

JASPER performed a total of 11 shots in 2016, including six that were designed to test the two-stage gas gun's functionality. Five more shots involved the use of plutonium, an integral part of the experimental work. Additionally, four of the shots involved Light Calibration, which helps establish a baseline for future experiments using the newly designed Pyrometry Diagnostic, according to Trent Otteson, JASPER project manager.

In addition to upgrading diagnostic capabilities, JASPER is increasing the current parameter regime that the gun operates within by changing the launch tube from 28mm to a larger bore of 40mm. The plan is to maintain both launch tube capabilities and make them interchangeable. This effort will provide researchers with the ability to:

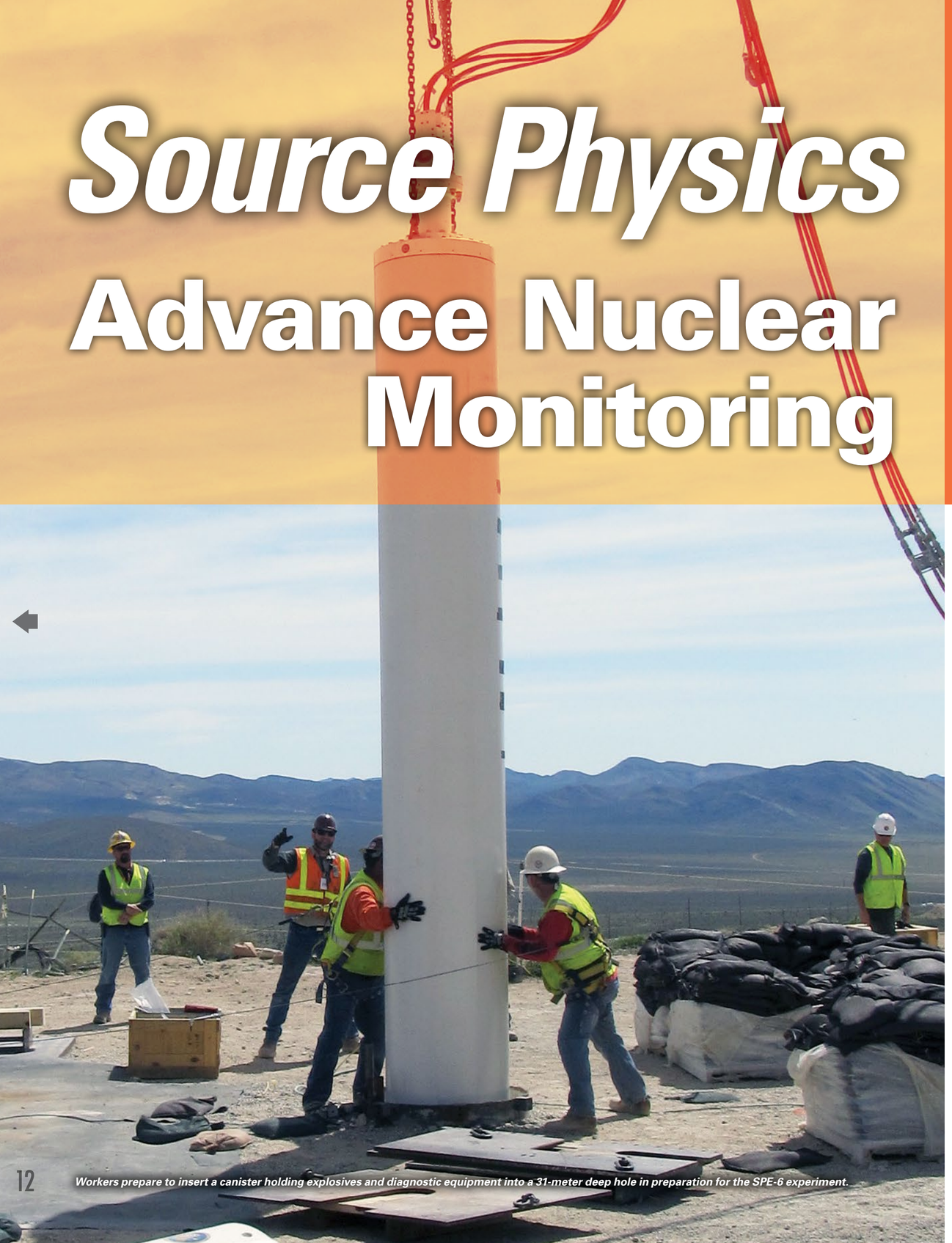
- Investigate both high and lower pressure ranges;
- Extend the current time duration over which high-fidelity data can be captured without concern from edge effects;
- Place multiple samples per target for A/B type comparisons.

"JASPER's ability to provide plutonium data on a regular basis continues to validate our stockpile, and provides valuable data on plutonium for our researchers," Otteson said. "We cannot become stagnant. To stay ahead, we must continue to adapt and grow. By doing so, we will extend the life of JASPER for a very long time and continue providing premier data for the program."

"JASPER's high level of performance demonstrates our personnel's commitment to support stockpile science and help ensure our nation's security," Otteson said. "You couldn't ask for a better team to support this important mission."

Source Physics Experiments

Advance Nuclear Explosion Monitoring Technology



Workers prepare to insert a canister holding explosives and diagnostic equipment into a 31-meter deep hole in preparation for the SPE-6 experiment.

The NNSS was a busy place in 2016 for advancing technologies used to monitor underground nuclear testing.

On Oct. 12, 2016, the U.S. Department of Energy's National Nuclear Security Administration (NNSA) detonated an underground conventional explosive at the NNSS as part of its on-going Source Physics Experiment (SPE) research efforts. This explosion was the sixth in a series of SPE experiments (SPE-6) designed to improve the Nation's capability to detect and characterize underground nuclear explosions and to help develop an advanced capability for the United States to monitor low-yield nuclear testing.

"The Source Physics Experiment series and NNSA's ongoing research and development at our national laboratories are key to strengthening our national security. These efforts advance technical solutions for treaty monitoring by the United States and its partner nations," said Anne Harrington, former NNSA Deputy Administrator for Defense Nuclear Nonproliferation.

By conducting the experiments near the location of previous underground nuclear tests, researchers are able to better compare data from conventional and nuclear explosions. This helps to improve the U.S. capability to differentiate low-yield nuclear test explosions from other seismic activity, such as mining operations and small earthquakes.

On April 26, 2016, a team led by the NNSS's Global Security directorate, successfully detonated the fifth experiment, SPE-5, which was the largest SPE shot to that date. It revealed new details about how seismic waves are generated from explosions and how they travel great distances.

SPE-6 included chemical explosives equivalent to 2,200 kilograms of TNT detonated 31 meters underground. Researchers will collect and analyze seismic, infrasound, optical, acoustic, geospatial, and magnetic data with technologies such as high-resolution accelerometers, high-speed video, drone- and ground-based photogrammetry, as well as light detection and ranging and synthetic aperture radar. Seismic data from the SPE series are shared on the Incorporated Research Institutions for Seismology website at http://www.iris.edu/hq/ for researchers around the world to analyze.

SPE-6 marks the end of Phase I of the SPE series. These six experiments were conducted in granite or "hard" rock at different depths and explosive weights. Phase II of SPE will focus on explosions in softer, less structured rock called alluvium. These different SPE phases allow researchers to determine the generic role that geology plays in affecting seismic waves generated by underground nuclear explosions. The five explosions planned for Phase II will be conducted over the next two years.

The SPE team is composed of researchers from the NNSS, LLNL, LANL, SNL, the University of Nevada-Reno, Air Resources Laboratory, and the Desert Research Institute.

International Diplomats

Visit Demonstrates Transformation of National Security Missions

The Department of Energy's National Nuclear Security Administration (DOE/NNSA) in 2016 hosted diplomats from more than 30 countries and two international organizations during separate visits at the NNSS and at the National Atomic Testing Museum in Las Vegas, Nevada.

The visits provided an up-close demonstration of NNSA's science-based Stockpile Stewardship Program, through which the U.S. is able to maintain the safety, security and reliability of its nuclear weapons stockpile without nuclear explosive testing. The tours also showcased NNSA expertise in applying world-class science, technology, and engineering to various nuclear security missions, including technical support for Comprehensive Nuclear-Test-Ban Treaty (CTBT) methodologies. NNSS—a former nuclear explosive test site until a moratorium on nuclear explosive testing was established in 1992—now serves as an experimental test bed and training ground for broad nonproliferation and national security missions beneficial to both the U.S. and the international community.

"We (were) pleased to be able to host international diplomats at NNSS to discuss the history of the U.S. nuclear program and demonstrate how our former nuclear explosive test site has been transformed into a national and international asset supporting a wide variety of nuclear nonproliferation and national security missions," said Anne Harrington, former NNSA Deputy Administrator for Defense Nuclear Nonproliferation. "Through transparency visits like this visit—and by hosting training activities—we hope to build confidence within the international community in U.S. nonproliferation and arms control commitments."

Visitors to the NNSS included Dr. Lassina Zerbo, executive secretary of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO PrepCom), and representatives of the United Nations Office for Disarmament Affairs. The delegation also included diplomats from Argentina, France, Indonesia, Nigeria, the Republic of Korea, Romania, Slovakia, South Africa, Switzerland, and the United Kingdom.

In addition to NNSA's representatives, the U.S. was represented by Ambassador Laura Holgate of the U.S. Mission to International Organizations in Vienna (UNVIE); Anita Friedt, Principal Deputy Assistant Secretary in the Department of State's Bureau of Arms Control, Verification and Compliance; and Craig Campbell of the Department of Defense's Office of Threat Reduction and Arms Control.

Senior representatives from NNSS, LANL, LLNL and Sandia National Laboratories also joined the visit and briefed the diplomats on the mission and contributions of the NNSA laboratories.

Although the CTBT has not yet entered into force, it provides a framework for preparing to conduct on-site inspections to certify CTBT compliance and verify if a suspicious event was a nuclear explosion. The CTBTO PrepCom selects experts from partner states to lend their expertise as surrogate inspectors. Recently, a total of 80 international experts were chosen by the PrepCom to participate in the third on-site inspection training cycle as new trainees. Selected trainees will undergo a rigorous set of classes, workshops, and exercises to gain the skills required to conduct inspections.

The NNSS hosted a CTBT PrepCom Nevada Familiarization Activity in May 2016, involving 50 international on-site inspection experts from 32 countries. The training, at a site where actual nuclear tests were conducted helped trainees to identify anomalies or artifacts associated with nuclear explosive testing. Based on evaluations by the participants, CTBT on site inspection training is most effectively conducted at an actual former nuclear explosive test site such as NNSS. "NNSS is an unmatched resource for the CTBT on-site inspection trainees, and we are pleased to again allow access to one of the few places in the world where trainees can see firsthand the effects of past nuclear explosions," said Harrington.

"The former test site is an excellent fit to develop our on-site inspection capabilities. The experience our future on-site inspectors can gain here is second to none," Dr. Zerbo said.

EMPLOYEE PROFILE

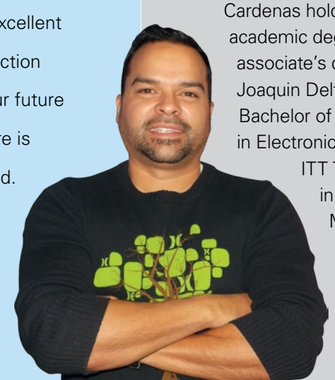
Mike Cardenas

One of Michael Cardenas' passions is to help California prepare the nation's most STEM-capable graduates. Cardenas, manager of the Calibration & Applied Analysis division at Livermore Operations (LO) in California, has been a leader of STEM (Science, Technology, Engineering, and Math) outreach for LO and in the local academic community in the San Joaquin Valley for more than 10 years.

In 2016, the North Central Valley STEM Center in Ripon, Calif., named Cardenas as STEM Advocate of the Year. As well, Cardenas also received a congressional award from California Congressman Jerry McNerney for his STEM outreach activities.

"I volunteer my time to encourage kids in STEM because I don't want anyone else to struggle the way I did on my path to obtaining a STEM degree," Cardenas said.

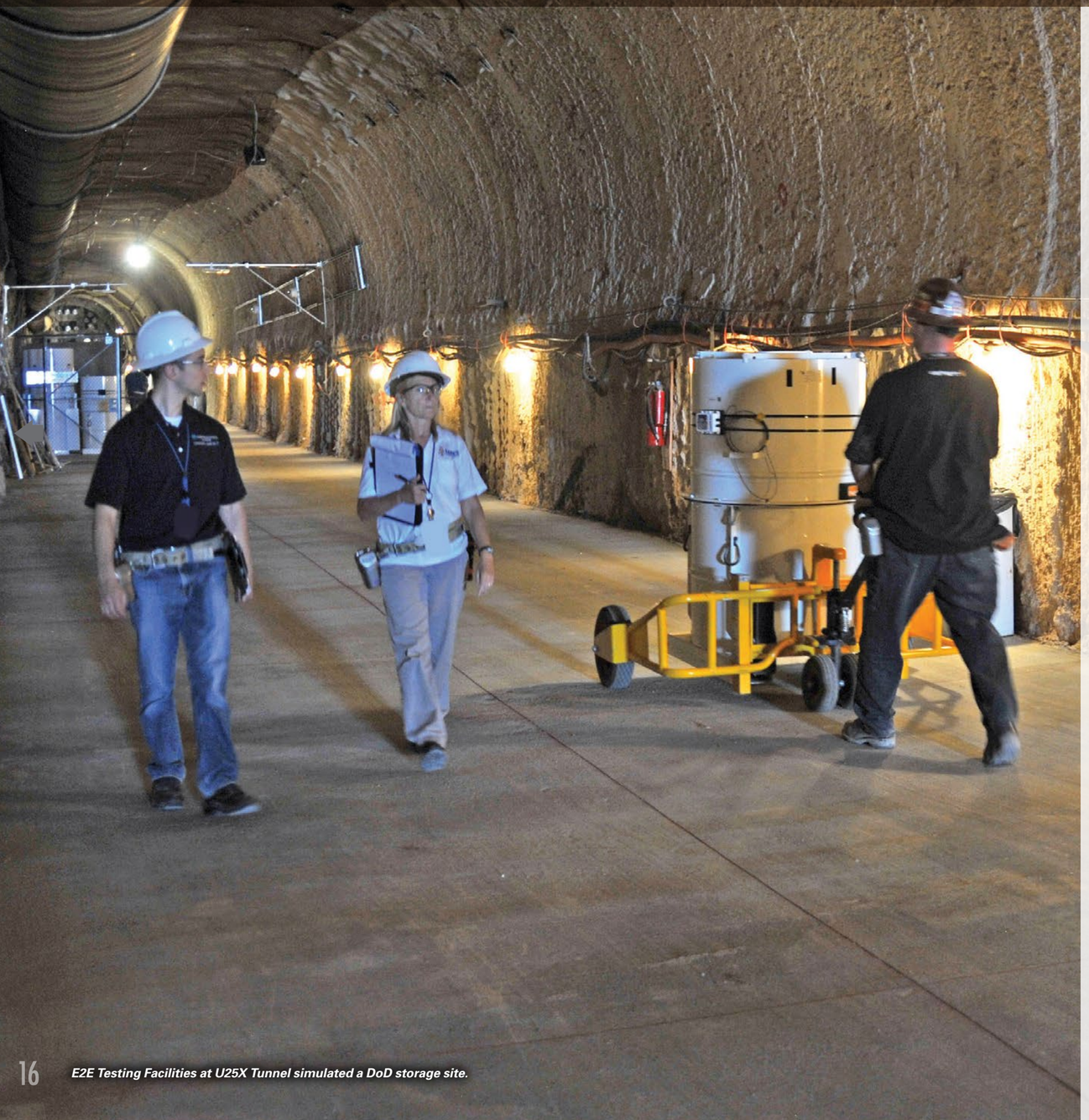
"Many kids, especially in the low-income districts for which we serve, may have the potential to become exceptional engineers or scientists. However, to help get them to finally graduate with a STEM degree, it takes the advocacy of parents, educators and industry partners to encourage and promote learning opportunities in all STEM disciplines. Additionally, having the NNSS' face in the community has its own strategic, long-term investment. Students who recognize our name early in their academic study will now know who we are as a STEM employer once they graduate from college," he said.



Cardenas holds multiple academic degrees: an associate's degree from San Joaquin Delta College, and Bachelor of Science degrees in Electronics Engineering from ITT Technical Institute in Sacramento and in Management from Charter Oak State College in New Britain, Conn.

Warhead Monitoring Campaign

Aids With Future U.S. Arms Control Initiatives



E2E Testing Facilities at U25X Tunnel simulated a DoD storage site.

The End-to-End (E2E) Warhead Monitoring Campaign is part of a comprehensive effort by the Office of Defense Nuclear Nonproliferation to support technology development and field-testing with respect to future arms control initiatives. The E2E Campaign is a NNSA project that evaluates technologies and techniques supporting arms control and treaty verification.

The vision of the E2E Campaign was a five-year effort to develop and demonstrate technology capabilities and assess them as part of a monitoring approach using a system evaluation methodology. Although the program ended two years early in 2016, many benchmarks in support of this effort were accomplished at the NNSS.

A key component of the E2E campaign was the NNSS test bed, which provided the physical site and the technical expertise required to test and exercise the monitoring approaches. The E2E Campaign enhanced and used facilities to provide a mock nuclear enterprise field environment for integrated system testing.

Additional materials were made available for measurements by selected technologies assigned to perform the confirmation functions. The NNSS test bed provided the national laboratories with field facilities in which to exercise and demonstrate their technologies.

In the process, the E2E campaign demonstrated remarkable success by fielding three distinct approaches for monitoring a nuclear weapon throughout the weapon's non-deployed lifecycle—including maintenance events, storage, and dismantlement. Further, the E2E Campaign has created a solid, systematic foundation for evaluating the performance of monitoring system design choices, which advances the ability to prioritize research and development (R&D) questions for arms control. Finally, the E2E Campaign expanded the number of subject matter experts available to support future arms control R&D activities with many early and mid-career staff at the national laboratories having their first substantial experience in this mission area.

Additionally, the development of the test bed faced a challenge that would prove staff's ability in overcoming obstacles. An October 2015 flood damaged roads leading to a tunnel, as well as access routes. The tunnel entrance was buried under a 10-foot-high debris pile. The emergency exit was also buried and the internal condition of the tunnel was unknown because it could not be accessed.

The Global Security Directorate management quickly developed a plan to remediate the erosion damage and gain entry into the tunnel. Remediation began November 30, 2015 and was completed in early 2016 following a monumental cleanup effort that involved numerous contractor personnel.

With the tunnel open and operational by January, there were many other noteworthy accomplishments of the E2E campaign. The E2E Campaign conducted six DAF Experiment Campaigns, as well as numerous LLNL Dome Experimentations. It conducted a series of significant test exercises at the NNSS, culminating with the major technical milestone of testing each of the three different approaches for warhead monitoring in the two-location test bed at the NNSS during a major exercise in April 2016. This exercise was followed two months later by the E2E Demonstration, which checked off a significant major NNSA Milestone Objective in the NNSA Strategic Plan.

The E2E Campaign presented five Papers for the Institute of Nuclear Materials Management Conference and presented four papers and six posters at the Nuclear Weapons and Material Security Program Review Project Review Meeting. It completed and submitted the E2E Final Report, with a video annex. It also was among the first NNSA Venture Project to complete a Comprehensive Technology Readiness Assessment Review.

The End-to-End Campaign is a first-of-its-kind research and development effort to develop and test a systems approach to warhead monitoring from initialization into a treaty regime through dismantlement of the warhead. This work is being done in advance of any treaty negotiations in order to provide new techniques and tools to support future negotiators. The E2E Campaign represents a United States interagency endeavor, with LLNL, LANL, NNSS, Pacific Northwest National Laboratory, and STL all serving as partners.

NNSS, INTERPOL Host First International Counter Terrorism Training

First responders from 11 nations took part in the first international emergency response training at the NNSS in 2016. The training is offered by the NNSS Counter Terrorism Operations Support (CTOS) program and is one of the most realistic training programs in the world, designed to help emergency personnel to respond to a nuclear or radiological emergencies such as a "dirty bomb" or other terrorist act.

More than 193,000 first responders from the United States have completed the CTOS training. CTOS recently offered the new course, organized with INTERPOL, designed for international first responders.

First responders are rightfully credited with being the people running towards an emergency when everyone else is running from it. They face daunting challenges during an emergency – trying to safeguard the area, respond to victims, and prevent additional injuries by stopping future incidents. During the course, crews learn to locate hidden sources of radiation, assess the threat, and to treat victims who may have been exposed. It's training that no one hopes to ever need, but it's vital for first responders to be prepared.

"Law enforcement, firefighters, paramedics and hospital workers from across the country participate in the training to ensure that U.S. first responders are prepared in the event of a radiological or nuclear emergency. Our staff is the best in the world at responding to those incidents," said Rhonda Hopkins, CTOS manager. "We're pleased that INTERPOL chose to bring a contingent of international first responders here for this one-of-a-kind training experience."

INTERPOL organized the training, bringing together 35 first responders from: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. INTERPOL's primary objective was to prepare the participants to prevent or respond to terrorist use of radiological or nuclear weapons. The course also addressed the need to develop a methodology for conducting effective, intelligence-driven and prevention-orientated investigations into incidents involving nuclear and other radioactive sources.

The NNSS provides the most realistic environment for this type of training. From 1951 to 1992, the U.S. tested nuclear weapons at the NNSS. Today, the 1,360-square-mile Site provides an environment where background radiation is sufficient to help first responders learn how to detect radiation, but under lower levels of exposure than doses found in a traditional chest X-ray or cross-country airline flight.

Aviation Professionals Win Top Honors

The NNSS Aviation Program was recognized by the U.S. Department of Energy as Aviation Program of the Year for 2016. Remote Sensing Laboratory (RSL) Chief of Maintenance Dave Krausnick was awarded Aviation Professional of the Year.

With the award, the aviation team was recognized for being the most outstanding, safest, and most efficient and effective in all aspects of the flight program. The NNSS Aviation Program is responsible for helicopters and fixed wing aircraft that conduct an array of special missions, ranging from aerial surveillance for radiological threats during major events around the world to aerial monitoring for consequence management to wildland firefighting operations at the NNSS. RSL's aviators also were called on to help in an advisory capacity during the 2011 tsunami and nuclear disaster in Japan. The aircraft are based out of Nellis Air Force Base in Las Vegas and Joint Base Andrews in Maryland.

Krausnick was recognized as the top professional in DOE Aviation whose operational skills and accomplishments contributed in the most outstanding manner to improving and sustaining the safety, efficiency, and effectiveness of the NNSS Aviation Program, said Richard Fischer, Aviation Section Manager at RSL.

"I am exceptionally proud of this accomplishment on behalf of our whole Aviation Team which includes our pilots, mechanics, operations and administrative staff, and our Aviation Safety and Management Team," Fischer said. "This is the result of a true team effort from an extraordinary group of talented professionals who are exceptionally dedicated and represent the best aviation professionals in all of the Department of Energy. Each and every member of our team brings value to our operation and customer, and this award reflects recognition of your truly outstanding efforts."

For many years, the RSL program has been noted as one of the nation's most prestigious programs for excellence and innovation in aviation management and administration, operations, maintenance, training and safety. RSL's aviation program also was recognized for more than 18 consecutive years of operations without an accident or incident, and several RSL team members have received numerous individual safety achievement awards.

RSL Aviation Chief Dave Krausnick

UNESE Experiments Help Detect Nuclear Explosions

A UNESE scientist records some measurement readings during the July 2016 radio-chemical tracer gas injection experiment at the Barnwell test bed in Area 20 of the NNSS.

Scientists at the NNSS are working on an experiment called the Underground Nuclear Explosion Signatures Experiment (UNESE) to improve the United States' capability to detect and characterize suspicious underground nuclear testing by foreign states. The $35 million project, funded by the NNSA's Defense Nuclear Nonproliferation Research and Development Office of Proliferation Detection, investigates key signatures emanating from underground nuclear explosions over a broad range of time scales.

UNESE is a collaborative research and development (R&D) project with NNSS, LANL, LLNL, Pacific Northwest National Laboratory (PNNL) and SNL. Its purpose is to better understand how the physical processes and features of the earth create, modify and transmit observable signatures that are particular to underground nuclear testing.

UNESE's objectives are to:

- Advance the state-of-the-art in underground nuclear explosion (UNE) detection, site location and identification
- Develop NNSS-based test beds to examine physics-based hypotheses and develop new modeling capabilities for UNE signatures in a variety of geologic settings, including analogs to sites outside the U.S.
- Target the development of new and existing technologies for measuring near-field environmental signatures complementing and corroborating existing known long-range signatures.

Attaining these objectives will allow the U.S. to improve capabilities to identify potential or suspected UNE sites, determine if a UNE has been conducted at a suspect site, and estimate key test characteristics (e.g., yield and depth).

"The success of the UNESE project is a true demonstration of teamwork across the NNSS and the NNSA. Its impact on national security is quite relevant in today's world," said Melissa Hunt, NNSS Global Security director.

UNESE may sound similar to the SPE, also carried out at NNSS. Both strive to improve our ability to detect underground nuclear testing, but SPE is centered on monitoring for the prompt seismic and acoustic signatures of an underground nuclear explosion, while UNESE focuses on monitoring for the longer-term signatures. These include radioactive gas emissions, changes in the orientation of the magnetic field of the geologic materials close to the detonation point, alterations in surface topography, and stresses to flora and fauna.

Scientists have been conducting experiments at the NNSS to study these post-detonation signatures since the 1993 Non-Proliferation Experiment, a chemical explosion that simulated a 1-kiloton underground nuclear detonation. There has been a significant uptake in interest in understanding UNE post-shot observables over the past five years, with predecessor projects to UNESE such as the Comprehensive Inspection Technologies and the Noble Gas Migration Experiment, both conducted at the NNSS. These efforts focused on radio-chemical gas transport from the UNE detonation point to the surface and other physical signatures at two legacy UNE locations on Pahute Mesa at the NNSS.

In July 2016, UNESE completed an experiment where radioactive and chemical tracer gases were injected underground near the detonation point of the Barnwell legacy UNE test at the NNSS. Before tracer gas was injected, boreholes varying in depth from tens of feet to nearly 1,800 feet were drilled around the perimeter of the Barnwell shot and instrumented in various ways to monitor pressures and extract soil gas samples from the subsurface. Soil gas samples have been collected routinely for weeks and sent to LLNL and PNNL for analysis.

Having completed all its planned experiments at the surface test beds, UNESE is transitioning in fiscal years 2017 and 2018 to complete a suite of similar experiments in P-Tunnel near and around the Disko Elm legacy shot. By transitioning to a tunnel where legacy UNE testing was conducted, UNESE researchers hope to gain insight into how the post-shot observables and signatures are affected by the emplacement scenario and a different geologic setting.

The ongoing successes of UNESE, its predecessor projects and its companion projects like SPE are vital in providing the necessary research and development to better understand the generation of key signatures associated with post-detonation nuclear testing. Vital to our national security is the ability to monitor for and detect the proliferation of underground nuclear weapons testing, and verify compliance of nation states with certain nonproliferation treaties.

An instructor gives a lesson in UAS support.

UAS R&D Takes Off at the NNSS

The NNSS has acquired numerous Unmanned Aerial Systems (UAS) as part of a R&D program. According to NNSS officials, the project is designed to expand the development of sensor technology for unmanned aerial systems and enable scientists to further the capabilities of current systems.

"This is a huge opportunity – a real game changer for the NNSS," said Jim Holt, president of NSTec. "A UAS can be used in situations where manned aircraft may not be used safely. These small aerial platforms can be used at the NNSS for sensor development, as well as site security, environmental monitoring, radiological remote sensing and national security applications."

NNSS acquired two Sandstorm UAS platforms from Unmanned Systems Inc. (USI), a company based in Henderson, Nev. USI is a small company with a variety of state and federal customers.

The Sandstorm UAS platforms are small to medium-sized, and can carry a payload up to 20 pounds. With the purchase, NNSS becomes a "full user" of UAS technologies. The NNSS has since acquired 17 UAS vehicles.

In December 2013, the Federal Aviation Administration (FAA) named Nevada as one of the six FAA authorized test sites for unmanned aerial systems. NNSS officials were instrumental in supporting Nevada's successful bid for the FAA Test Site designation, and continue to work with the Nevada Institute for Automatous Systems to further the UAS initiative in the state.

The NNSS was selected because it has the potential to be a premier testing, evaluation and training facility for UAS platforms. Successful UAS activities have already been conducted at the site by other federal and commercial entities as a part of a Strategic Partnership Program in which the NNSS is involved.

Daniel Blumenthal, program manager of NNSA's Consequence Management Program in Washington, D.C., supports the research into using unmanned systems for radiological remote sensing.

"The ongoing aerial measurements collaboration between the United States and Japan after the 2011 Fukushima accident has demonstrated the expanded need for such measurements and the value of research into adding UAS-based methods to the well-established aerial measuring systems."

In Nevada in April 2016, representatives from 12 foreign countries exchanged technical ideas and information regarding the usage of unmanned systems for emergency response and remediation missions. Japan provided insightful information regarding the operational usage of unmanned systems for continuous monitoring after the Fukushima accident. As a part of the Technical Exchange, a UAS demonstration flight was conducted at the NNSS to display the system's capabilities.

"The acquisition of the UAS platforms is a big step forward," said Karen McCall, UAS program manager at NNSS. "In a few years, we will look back and realize how we have expanded our national mission. We are looking at a multi-modal approach for data fusion of a variety of sensor technologies from radiological, imagery, and other interesting remote sensing systems.

"The process to acquire the platforms was long and intense. We put together a team of scientists and aviators across multiple NNSS divisions. Over a six-month period, the team determined the best platform to meet our R&D requirements."

Included in the contract with USI is training, service, and maintenance. The FAA requires all commercial UASs to be flown by a licensed pilot. McCall said seven NNSS team members have been placed in the training, including pilots, engineers and mechanics.

"The UAS provides another platform for sensor development and integration," McCall said. "In order to grow, we also need a team who knows every detail about the operation of the platforms, and how to integrate a variety of sensors.

EMPLOYEE PROFILE

Karen McCall

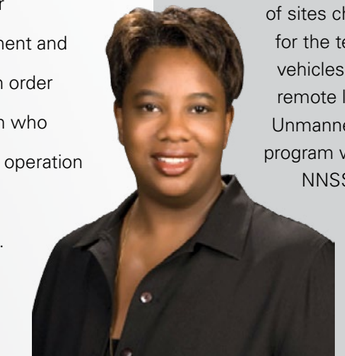
When it comes to getting projects off of the ground, Karen McCall is an expert. As the manager of the NNSS Unmanned Aerial Systems (UAS) program, McCall has spent the last two years putting together a team and the tools necessary to expand the NNSS' capabilities for safely detecting and monitoring radiological and nuclear materials.

McCall and her team are building a program that combines unmanned vehicles with state-of-the-art sensors that are capable of detecting radiological and nuclear materials. The program now boasts 21 unmanned vehicles.

Using sensors developed by the NNSS as well as those commercially available, McCall and her team are working to integrate those into the fleet. That integration will allow the vehicles to be used in a variety of missions, from helping to secure the NNSS itself to emergency response.

The vehicles could be beneficial in incidents like the Fukushima Power Plant disaster or other emergencies where the potential for danger is high and the full scale of the impact is not clear.

"We don't want to send our first responders into a situation unprepared," she said. "We can send in unmanned vehicles with sensors attached to collect data and assess the situation first to ensure we can protect people and property."



Nevada was one of a handful of sites chosen in the nation for the testing of unmanned vehicles due primarily to its remote location. The NNSS Unmanned Aerial System program was born out of the NNSS' Site-Directed Research and Development program.

CLOSING TIME

Environmental Management Experts Complete Remediation of 1963 Double Tracks Test Site

Soil sampling at Double Tracks in 1995.

The collective efforts of a tenacious team of scientists and field crews from the NNSS achieved a long-awaited milestone in the Environmental Management (EM) program.

After more than 20 years of hard work and cross-agency collaboration, remediation efforts of Double Tracks have been completed to meet current U.S. Air Force (USAF) land-use requirements. Double Tracks is the site of a 1963 plutonium dispersion test and is located north of the NNSS on the Nevada Test and Training Range (NTTR).

Completion of environmental characterization and remediation at Double Tracks marks the first time a plutonium dispersion site on the NTTR has reached the completion phase outlined in the legally binding Federal Facility Agreement and Consent Order (FFACO). This completion does not mean the sites are releasable for public use; however, it does allow for a less restrictive management of the sites.

"The completion of Double Tracks is a reflection of the success and value of collaboration that occurred at all stages to work through the process," said Rob Boehlecke, DOE NFO Environmental Management Operations Manager. "This decades-long effort was achieved through the collaborative efforts of NFO federal and contractor staff, State of Nevada Division of Environmental Protection, and the U.S. Air Force. And the benefits of this collaboration will continue as we work toward completion at other sites in the future."

The process began in 1994 after initial investigations of the Double Tracks site were conducted. In 1996, contaminated soil and debris within the identified area were removed and safely disposed and the area was revegetated. Because of the complexity and the multiple stakeholders involved, the project was tabled and restarted in 2012. Due to the time lag, and to ensure that data was collected using the most modern techniques available, additional investigations were planned to establish current conditions of the site. The collaborative effort continued and, in 2014, additional data was collected in order to determine whether site completion objectives had been achieved. The USAF also conducted their own independent samples and data collection.

Which brings us to today.

Based on these investigations and cleanup efforts, it was determined that further corrective actions were not required and remediation was considered complete under the FFACO. However, if the USAF mission and/or land use changes, site conditions may need to be reassessed.

Not only does the transition to completion phase validate more than 20 years of data, but it also solidifies the working relationship between the DOE and its key stakeholders.

"The closure of the FFACO is an important step in continuing the cleanup efforts of the DOE EM program, but it couldn't happen without great working relationships with the Nevada Division of Environmental Protection and the U.S. Air Force," said Tiffany Lantow, DOE NFO Soils Activity Lead. "Those relationships make it possible to discuss options and information and work together towards a single goal," she added.

DOE is responsible for the remediation of sites with legacy contamination resulting from historic nuclear research and testing at the NNSS and NTTR, including the Tonopah Test Range. The completion of this environmental restoration mission is governed by the FFACO, a legally binding agreement between the DOE, State of Nevada, and the U.S. Department of Defense, which establishes a framework for identifying, prioritizing, investigation, remediating and monitoring the contaminated sites.

History of Operation Roller Coaster/Double Tracks:

Operation Roller Coaster, conducted in 1963, was a joint exercise between the U.S. Department of Defense, Atomic Energy Commission, and the United Kingdom, on USAF land at the NTTR. The project consisted of four conventional explosive detonations of nuclear devices designed to determine if nuclear weapons could be accidentally set off and produce a nuclear yield.

The devices were detonated at four sites: Double Tracks and Clean Slate I, II, and III, and proved that accidental yield-producing nuclear detonations would not occur. However, as a result of the experiments, the soil in the area was contaminated.

Hard Work in Groundwater Monitoring Pays Off

Click here to watch an overview video of the NNSS groundwater characterization program.

NNSS Scientist Jenny Chapman (foreground) discusses groundwater characterization at Frenchman Flat with a resident of Amargosa Valley, NV at the 2016 NNSS Groundwater Open House.

Between 1965 and 1971, ten underground nuclear tests were conducted at Frenchman Flat on the NNSS, each providing valuable data in a few spectacular seconds. In the decades to follow, NNSS scientists worked to understand the effects of those tests on the site's groundwater. Their studies have confirmed that the contamination from nuclear testing in groundwater at Frenchman Flat poses no risk to the public, and in a milestone achievement for the NNSS groundwater characterization program, the area has been approved by the State of Nevada Division of Environmental Protection to transition to long-term monitoring.

Long-term monitoring is the end goal of the strategy outlined in the FFACO for the five groundwater investigation areas at the NNSS. Frenchman Flat is the first to enter into this important final stage. While entering this stage signifies a thorough understanding of the groundwater flow system, routine monitoring at Frenchman Flat will continue, and results will continue to be reported annually in a publicly-released report.

The success at Frenchman Flat follows over 20 years of hard work and continuous study carried out by multiple organizations: NNSS scientists; Desert Research Institute; LLNL; LANL and the U.S. Geological Survey. In addition, two external peer reviews were conducted. During this time, multiple groundwater characterization wells were drilled, three-dimensional computer models were developed and refined, and boundaries for restricted access were established. "The NNSS is one of the most studied locations in the world, and this achievement is a testament to the teamwork between all organizations involved," said Bill Wilborn, manager of NNSS groundwater characterization for the DOE.

In preparation to enter the long-term monitoring stage, scientists prepared a report detailing the studies conducted at Frenchman Flat. Their findings include that contaminated groundwater is not expected to leave the Frenchman Flat basin, and that radionuclides in the groundwater will travel less than a mile in 1,000 years. "The groundwater flow system and potential for contaminant movement is well understood, to the point that protection of the public is ensured," said Wilborn.

Transitioning Frenchman Flat to long-term monitoring provided NNSS scientists and staff with an invaluable experience for understanding the necessary balance of modeling, monitoring, and restricted access that is protective of the public and the environment. It also sets the stage for other NNSS groundwater investigation areas. "Although the regulatory strategy is the same, each will have unique challenges due to the varying subsurface environments," said Wilborn. Groundwater studies at the NNSS will continue with the goal of transitioning all areas of the NNSS to the long-term monitoring stage.

Click here to check out the CTOS Center for Radiological/Nuclear Training playlist on YouTube.

EMPLOYEE PROFILE

Rhonda Hopkins

When it comes to being ready for an emergency, Rhonda Hopkins is prepared – and she ensures that thousands of first responders are, too. As manager of the CTOS program, Hopkins oversees counter terrorism training at the NNSS. First responders from around the country flock to the NNSS for some of the most realistic training in the world to prepare them to respond to a radiological or nuclear emergency. Instructors ensure that students leave knowing how to respond in the event that a "dirty bomb" is discovered.

Participants who come to the NNSS experience a week of training on the site where above ground nuclear tests were once conducted. The location is safe today for training and provides a unique and exclusive learning opportunity for first responders.

"There are 3 million emergency responders in the United States. Our mission is to prepare them for radiological/nuclear terrorist threats. And we take this mission very seriously. We provide the training to use their equipment for both the prevention of terrorist threats and the response to terrorist incidents."

The CTOS program will train their 200,000th student in the coming year, either at the NNSS or through mobile training courses conducted in first responders' home towns.

Hopkins came to the CTOS program from the Remote Sensing Laboratory at Nellis Air Force Base, where she was hired as aerial measurement systems scientist and worked her way to manager of the Federal emergency response teams.

CGTO representatives examine the revegetation site at Area 5.

Tribal Connections Aid Revegetation Efforts

For help revegetating the complex terrain of the Mojave Desert, the Environmental Management Program at the NNSS reached out to the people who know the land the best.

Representatives from the Consolidated Group of Tribes and Organizations (CGTO) were asked by the NNSS to develop recommendations on how to revegetate 92 acres of land at the Area 5 Radioactive Waste Management Complex. Area 5 is a facility dedicated to the permanent disposal of low-level radioactive, mixed low-level radioactive, and classified waste generated primarily by environmental cleanup activities at DOE facilities across the United States.

NNSS attempted to revegetate portions of the acreage three times between 2011 and 2015, but despite varying methods of irrigation and seeding, and no contaminants present in the topsoil, native plants failed to flourish. In 2016, NNSS turned to the CGTO to incorporate the knowledge and wisdom gained from traditions and practical skills passed down for generations.

Two CGTO members from each of three broad ethnic groups worked on the project along with CGTO spokesperson Richard Arnold and ethnoecologist Dr. Jeremy Spoon of Portland State University Department of Anthropology.

Arnold agreed they were the right group for the job, stating, "The land is out of balance, and the only way that can be corrected is with tribal intervention. We have a cultural responsibility, and serve as the voice of the land."

Representatives from the CGTO met with the NNSS staff in March of 2016, when NNSS presented on past revegetation attempts, as well as details of disposal cell construction and conditions. Another meeting took place in June and included a visit to the NNSS, where the CGTO representatives examined the revegetation site at Area 5 and a past successful revegetation site at Area 3.

The site visit was integral to the CGTO's recommendations, said Arnold. "It's important for tribal people to see, feel, communicate, and interact with the land," he explained. Between meetings, the CGTO representatives considered the information presented by the NNSS, conducted research, and reviewed existing ethnographical literature.

After intense research and study, CGTO representatives submitted their recommendations to NNSS. The recommendations included greater involvement of tribal groups in the revegetation process and the use of test plots to determine the best approach to ongoing revegetation.

According to Scott Wade, Assistant Manager for NFO, the project represented a commitment to provide for greater involvement from the tribal groups. Arnold believes this commitment goes both ways, stating that the tribal groups and NNSS can't be divided on issues concerning the land. "We need to be all on the same page, singing the same song," Arnold says. "Only then will the land hear our message and begin to heal."

CGTO representatives with staff from DOE/NFO, DRI, and Portland State University at the NNSS.

Three desert bighorn sheep at the NNSS. Notice how their coloring blends with their environment.

Scientists Study Nevada's State Animal

His massive horns curl over his ears and weigh more than 20 pounds. But that doesn't slow down one desert bighorn sheep ram that has been set free at the NNSS.

Six desert bighorn sheep were captured and studied in a major Site-wide undertaking led by the U.S. Geological Survey (USGS).

The state animal of Nevada, desert bighorn sheep were a rare sight at the NNSS for almost 50 years, with only eight recorded observations between 1963 and 2009. But in the past seven years, numerous numbers of the animal have been observed by NNSS biologists and wildlife cameras during a mountain lion study in the Site's western and southern portions.

In order to better understand this sheep population and where they came from, a helicopter was used to locate them and maneuver them in a safe place. Two ewes and four rams were captured with a net gun, and blood samples from them were taken. These samples contain valuable data that will give scientists information on disease prevalence, radionuclide burdens, and how different herds in southern Nevada are related.

Five of the sheep were fitted with radio collars that are set to record their GPS locations six times a day. For a five-day period after each month, the collars will record locations every hour so that scientists can evaluate fine-scale movements and habitat use. Later, when the sheep were released, the scientists watched in awe as the graceful animals sprinted over rocks and crags back into their desert home.

Derek Hall, senior scientist with the NNSS, said that this was "a great collaborative effort between the U.S. Department of Energy and other agencies such as USGS, the Nevada Department of Wildlife and Nellis Air Force base to gain valuable data about sheep populations on the NNSS and throughout southern Nevada."

Hall believes these sheep came from transplants that were done in Spotted Range, Specter Range and Stonewall Mountain to preserve the species.

"We think those populations came in and filled a void on the Site. We believe these sheep are new." When asked about other animals at the Site, Hall said the mule deer and wild horses are other subjects being studied. He also said that greater numbers of antelope and wild burros have been observed, and hoped to study the increase in those populations in the future.

"The information the sheep provide will give us new understanding of the ever-changing wildlife populations at the NNSS," he concluded.

EMPLOYEE PROFILE

Charlotte Carter

When NNSS Health Physicist Charlotte Carter graduated from Southeastern Oklahoma State University with a degree in physical science, she landed a terrific job out of college setting up a biology laboratory for a meat packing company in southern Oklahoma.

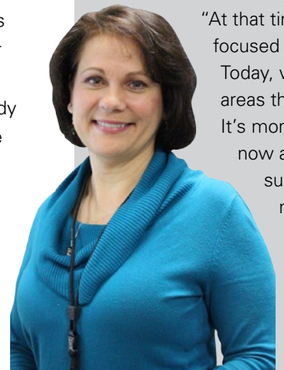
"The company handled meat processing," Carter recalls. "It was really a great job to get coming right out of school. We dealt with bacteria and microorganisms, helping ensure the company's products were safe for the public."

That extraordinary position, which gained her much valuable experience, would serve her well later when she attended Colorado State University as part of a U.S. Department of Energy Defense Programs fellowship. She obtained her Master's in Health Physics, then brought her expertise to Nevada where she went to work at the Nevada National Security Site.

That was 26 years ago, Carter says.

Today, Carter's background in health physics has transitioned from her early years of working in the underground testing program to her role today at the NNSS. She serves as a Project Liaison for important defense programs projects such as the National Criticality Experiments Research Center and the Site-Directed Research and Development program.

"I was fortunate to come in right at the end of underground nuclear testing at the NNSS," Carter says. "At that time, everyone was focused on one mission. Today, we have so many areas that we work in. It's more challenging now as we handle such a myriad of missions. It's an exciting time to work at the Site."



3D TECHNOLOGY

Gives New Dimensions to Mission

Lorrie Capitanelli at the Z printer at the North Las Vegas facility.

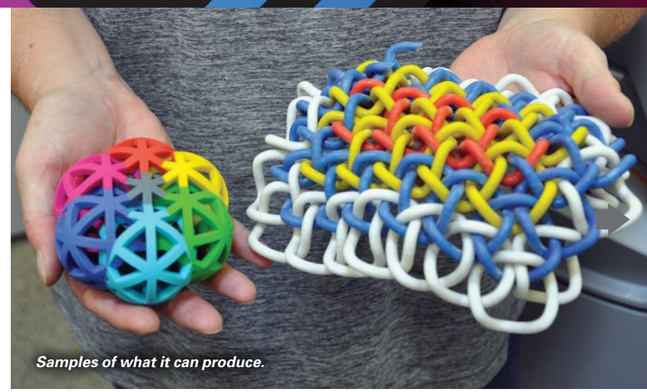
3D technology—the ability to create objects or areas in three dimensions from computer programming—is aiding scientists with the NNSS to not only produce miniature models of items used for experiments, but also provide a video-type "you are there" rendition with geospatial mapping.

3D Printers Create Life-like Models

The NNSS uses 3D printers to produce life-like miniature models of objects used in subcritical experiments. The purpose of using the 3D printers is to showcase models of existing or future experiments for funding by the NNSA. The 3D printers even create parts for our unmanned aerial vehicles and on-board sensors, including enclosures for the electronics (printed circuit board, wiring harnesses, GPS receiver, 900 MHz transceiver and other components).

3D printers are in use at our facilities in North Las Vegas, Santa Barbara, Calif., Livermore, Calif, and in New Mexico.

At the North Las Vegas facility, for example, the Z Printer has a roller bar that moves forward and back upon a thin bed of powder. The powder, composed of plaster and vinyl polymer, appears as smooth as paper until it creates a sheet of powder that is .0038 inches. Similar to an inkjet printer, the printer heads move over it. The machine deposits a liquid binding material. As it prints, it embosses the binder and powder and model from the base up. When it's finished, it molds the plaster-hardened material into a composite, creating an object from a 3D computer model with full-color capacity. Technicians control the entire 3D process from a computer, where they build the objects from their CAD (computer-aided design) software to create, say, a ball. It's modeled then converted it to another file format called STL (stereo lithography) that the printer recognizes. Then they send that file to the computer.



Samples of what it can produce.

Fitting Large Equipment through Fly-through Rendering

Also in use is a 3D "fly-through rendition," a CAD-driven visualization through 3D modeling that uses computer-driven light detection and ranging images for geospatial mapping. It almost looks like a video, but it's not.

Let's say you want to move a large and bulky instrument into a tight room but would prefer to get an exact concept through computing, instead of using manual labor and perhaps some trial-and-error. Particularly, you need to know if this equipment will fit through a doorway or turn a corner. Fly-through rendering helps with that. Given that the computer receives exact calculations from you, the 3D fly-through takes you to the room from a bird's eye view, or zips you straight ahead past other rooms until you get to your desired destination. This active rendering places you in the scene as if it's giving you a tour of the room and the paths leading there.

The NNSS has more plans to use its 3D technology for future projects and its unmanned aerial vehicles.

JOLT II Technology Aids National Security

The NNSS offers a wealth of resources to help industry develop new products and services that will contribute to energy independence, enhance national security, protect the environment, and increase economic prosperity.

In that light, the Technology Transfer Program enables industry, small businesses, universities, and other government agencies access to the Site's applied science, people, and infrastructure. The management and operating contractor has seized upon the benefits of this program by transferring one of its technologies, called JOLT II, to the private sector. JOLT II is a small portable electronic device which lets local, state, and federal bomb technicians and explosive ordinance disposal technicians assess improvised explosive devices. With JOLT II, they can more effectively eliminate the threat.

The JOLT series of devices was developed at the Remote Sensing Laboratory at Nellis' Special Programs division for the DOE's NNSA and other government sponsors.

"Last year, we transferred JOLT II technology to several U.S. companies. Currently, two private companies, Tactical Electronics (www.tacticalelectronics.com) and WMDTech (www.wmdtech.com) are producing their versions of the device for sale. Tactical Electronics' JOLT PRO (their enhanced version of JOLT II) was recently showcased at the National Shooting Sports Foundation Shot Show conference in Las Vegas. This transfer of one of our technologies enhances U.S. economic competitiveness, assures value for the consumer, and is a great success," said Robert Koss, manager of the Strategic Development Office.

Site's Solar Power Brings a New Era of Sustainable Technology

As the NNSS looks ahead to 2017, an influx of solar power projects represents a move to alternative energy in a variety of mission areas. The first of these efforts actually began in 2016 with the arrival of a new portable solar-powered, plug-in electric vehicle (PEV)-charging station. It is expected to maximize transportation flexibility while minimizing environmental impact.

The Fleet, Fuel and Equipment Services division received the new charging station in early 2016. Located in its Light Fleet parking lot in Mercury, the solar-powered PEV charging station is the first of its kind within the DOE/NNSA.

The introductory use of this sustainable technology is important in advancing the use of PEVs at the site while greatly reducing the consumption of petroleum fuels.

"The portable design allows us the flexibility to use PEVs in local or remote regions of the NNSS without the burden of locating a nearby power source needed for the fixed pole charging stations," said Site Service Manager Ricky Medina.

The fully transportable charging station can charge multiple PEVs at once, day and night, and it is 100 percent solar-powered. The station is structurally certified to withstand winds up to 110 MPH. It also has an on-board energy storage which will maintain power during a blackout or grid failure. Along with its reliability, the charging stations are extremely cost effective.

"It is way less expensive than installing the fixed/hard-wired charging stations," said Medina. Although this is the first unit to arrive, Medina does not think it will be the last.

"There could very likely be more. We need to ensure the technology works and stands up to the rigorous environmental conditions that are experienced at the NNSS," Medina said.

The NNSS is progressing towards achieving an initial goal set by the Federal government to "reduce agency greenhouse gas emissions by at least 40 percent over the next decade while at the same time fostering innovation, reducing spending and strengthening the communities in which our federal facilities operate." The Site is doing that by establishing a fleet mostly comprised of PEVs in relation to petroleum powered vehicles.

NO BARRIERS

Safety Initiatives a Combined Effort Across the NNSS

Safety is paramount in everything NNSS employees do, and it doesn't matter which contractor or organization you work for. It is a culture that is fostered through outreach and activities that promote safety on a day-to-day basis across all organizations.

In 2016, the emphasis on safety was never more apparent than in a joint-effort between the management and operating contractor, and the Site's security contractor. Both NSTec and Centerra maintain the U.S. Department of Energy Voluntary Protection Program (VPP) certification. Centerra enlisted the aid of NSTec's safety experts to help achieve recertification.

Contractors who meet the requirements for outstanding safety and health programs receive STAR recognition, the highest achievement level. Both contractors have achieved this through consecutive years.

In 2016, Centerra recognized NSTec, in particular VPP coordinator Mike Kinney, who continues to lead numerous safety initiatives at the NNSS. He was presented with an Award of Distinction from Centerra Group's Board of Directors. Centerra-Nevada's General Manager Martin Glasser personally thanked Kinney for helping the company recertify for the STAR recognition.

"I want to compliment Marty and his leadership team for having the courage to provide their employees with an 'open book' to enhance their collective safety programs," said Kinney, manager of the Occupational Safety & Health division in NSTec's Mission Assurance & Safety directorate. "In turn, the complete Centerra-Nevada team is to be congratulated on their willingness to embrace change and take ownership of the associated initiatives."

The VPP Superior Star award shows the company has demonstrated a consistently superior level of performance in meeting established safety and health goals, conducting outreach and achieving an injury and illness rate significantly below the average for similar operations. The program closely parallels the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) VPP.

DOE VPP also includes coverage of radiation protection/nuclear safety and emergency management because of the type and complexity of DOE facilities. Much like the OSHA program, DOE VPP provides several proven benefits to participating sites, including improved labor/management relations, reduced workplace injuries and illnesses, increased employee involvement, improved morale, reduced absenteeism, and public recognition.

The DOE VPP has three levels of recognition: STAR, MERIT and DEMONSTRATION. Contractors whose programs meet the top requirements for outstanding safety and health programs receive STAR recognition. Contractors with highly effective programs who commit themselves to attain STAR status within a five-year period receive MERIT recognition. DOE uses the DEMONSTRATION program to recognize existing achievements in unusual situations about which more information is needed before approval requirements for the STAR program are determined.

Contractors that choose to apply to the VPP must develop robust safety and health management systems and demonstrate effective implementation of safety and health procedures. These contractors are subject to frequent DOE reviews.

"Safety is at the forefront of our culture, and Mike is a passionate and energetic team leader in promoting the Site's safety programs. We are proud that Mike applied that same passion and energy to where Centerra-Nevada earned their VPP STAR recognition," said NSTec President Jim Holt. At NSTec, Kinney has been instrumental in helping the company retain its own DOE VPP STAR certification for seven consecutive years. Centerra has been a STAR site since 2001.

NNSS security contractor Centerra received its fifteenth VPP STAR award.

Senior Scientist Dr. Marylesa Howard presented mathematical research to undergraduate math students during a colloquium at Lee University.

Mathematicians Partner with Universities to Solve Data Analysis Problems

When transitioning from college to career, one of the biggest challenges students face is learning how to take what they were taught in the classroom and transform that into skills for solving real-world problems.

Addressing this challenge for math students, the National Science Foundation and the Mathematical Association of America (MAA) began the Preparation for Industrial Careers in Mathematical Sciences (PICMath) program. This program helps college and university professors design courses for math students that are focused on solving real problems provided by industrial partners.

The NNSS Defense Experimentation & Stockpile Stewardship (DE&SS) directorate has a long history of strong academic partnerships. DE&SS' Signal Processing and Applied Mathematics team, which includes Dr. Marylesa Howard and Dr. Aaron Luttman, are active in the MAA. So it was no surprise when PICMath Director Dr. Suzanne Weekes of Worcester Polytechnic Institute in Massachusetts asked Howard and Luttman to get involved right away when the program began.

With the support of Program Integration Vice President Raffi Papazian, Luttman and Howard partnered in spring 2015 with a PICMath student team from Winona State University in Minnesota. The project was so successful that the PICMath director invited Howard to speak at the annual PICMath faculty workshop at Brigham Young University in Utah. Luttman served as a project reviewer for 12 other industry university projects.

In the program's second year, the NNSS was asked to submit two projects for PICMath teams. Howard is now collaborating with students from Lee University in Tennessee on a project titled, "Broadband Laser Ranging Diagnostic Analysis." Luttman is collaborating with students at Elon University in North Carolina on a project titled "X-ray Imaging Performance Analysis." Both teams are working with real, non-classified NNSS data and developing data analysis techniques. During the semester, Luttman and Howard have regular conference calls with the university teams to answer students' questions. By the end of the semester, the teams will have submitted to NNSS and the PICMath program a report on their accomplishments. Their work also was presented at the Society of Industrial and Applied Mathematics annual meeting in Boston.

The NNSS PICMath partnership continues, with Luttman speaking at the PICMath faculty workshop at BYU. He is, once again, a project reviewer for the entire PICMath program.

Firefighters from the NNSS give out holiday toys to kids.

NNSS Gives Back to Community

NNSS employees are dedicated to giving back to the communities in which they live. Numerous efforts are carried out each year, from the American Red Cross to United Way, and other individual and corporate donations.

Centerra-Nevada Donates $5,000 to Local Elementary School

Security contractor Centerra Group LLC, represented by Centerra-Nevada staff, donated $5,000 to their Business Focus School Partner, Jacob E. Manch Elementary School, and principal Anthony Nunez at the beginning of the 2016 school year.

Nunez said that he was extremely grateful for the continued support of Centerra-Nevada and the generosity of the gift. The school used the funds to purchase new computer equipment for the students. Nunez said he was also pleased with the school's recent improvements and the many accomplishments made by the entire school faculty and students to help define their Leader in Me program.

J.E. Manch Elementary School supports approximately 900 students from pre-kindergarten to fifth grade with 43 full-time teachers.

NNSS Employees Help Southern Nevada Charities

Students in Southern Nevada headed back to school thanks to the efforts of Nevada Enterprise employees.

Piles and piles of notebooks, pencils, crayons, markers, rulers, binders, scissors, tissue boxes, writing paper, paper towels, post-it notes, folders, glue and backpacks were donated during the National Security Technologies (NSTec) and Centerra-Nevada school supply drives. NSTec's donations went to focus schools Kit Carson Elementary School and Jim Bridger Middle School; Centerra-Nevada's supplies supported their focus school, Jacob E. Manch Elementary School. In addition to supplies, NSTec was also able to donate $3,500 to each of their focus schools due to a fundraising effort put on by employees of the CFO & Enterprise Services Directorate.

"The schools were extremely surprised and overwhelmed when we handed them checks in addition to the school supplies," says Barrett Shaw, NSTec's supply drive coordinator. "It almost brought them to tears."

But that's not all.

Firefighters and paramedics from the NNSS Fire and Rescue Department also collected hundreds of pairs of shoes, money and school supplies to help disadvantaged children in Las Vegas. The shoes and money went to Goodie Two Shoes to assist in resupplying their shoe stock after they were robbed of $20,000 in supplies last summer. School supplies were collected as part of Walmart's back to school efforts in helping children around the valley.

Employees Take Part in "Day of Caring"

NNSS employees were among the approximately 1,000 volunteers who participated in United Way of Southern Nevada's first Day of Caring on Friday, Sept. 30. The one-day, community-wide volunteer event saw the completion of 91 projects for 23 non-profit agencies and 16 elementary and middle schools.

Twenty-one NNSS volunteers spent the morning at Three Square Food Bank packing after-school meals for school children and bagging produce for families. Three Square is Southern Nevada's only food bank; and relies heavily on volunteers to help pack and distribute about 45 million pounds of food each year to more than 300,000 people. In just three hours, our volunteers (and others from the community) packed 1,912 after-school meals and bagged 6,631 pounds of produce.

The Nevada Field Office and contractor companies support the community in other ways, such as Adopt-a-Family and other holiday giving campaigns in December.

Eliminating Excess Materials Reaches New Heights

With a 65-year history spanning the Cold War – and thousands of projects performed within its boundaries – the NNSS was bound to have materials left over from years of defending the security of the nation.

In 2012, Site Services personnel set out to find a way to eliminate excess materials located in holding yards around the 1,360-square mile Site. In doing so, the NNSS has experienced budget offset and financial savings that by 2016 had reached into the millions.

NNSS Site Services Asset & Material Management Department (A&MM) established a performance measure for 2016 based on acquisition cost with a target goal of $20 million and a stretch goal of $22 million to process excess material located throughout the NNSS and off-site locations.

A&MM exceeded the stretch goal by processing 23,438 items with an acquisition cost of over $32 million. This outstanding accomplishment could not have been done without the team work from numerous groups.

The following are other notable cost savings and accomplishments in 2016 as a direct result of this work:

- $11.8 million of the $32 million came from the Defense Experimentation and Stockpile Stewardship (DE&SS) Directorate's Special Cleanup Project.
- Over $1 million was redeployed to other NNSS projects.
- Over $3.3 million was transferred to other NNSA/DOE, Federal and State Agencies, and Universities.
- Over $3 million in non-Environmental Management Liability savings.
- Over $250,000 in labor costs and disposal fees was realized through refrigerant reclamation, cylinder recertification, waste diversion, and reuse/recycling from clean-up of the Area 6 Heating, Ventilation, and Air Conditioning (HVAC) bone yards.
- $492,000 of revenue generated from sales of excess property.

In July 2012, an Excess Integrated Project Team (Excess Team) consisting of employees from A&MM and Radiological Operations, was formed to improve the disposal process for excess government property as well as 1) reduce the footprint of government property that no longer has a mission requirement; 2) lower non-Environmental Management liabilities; 3) reduce inventory; 4) increase sales revenue; 5) reduce the amount of material going to the landfill and promote additional Pollution Prevention recycling; and 6) enhance the NNSS for current and future programs.

Through hard work, dedication, and assistance from other Directorates within the NNSS, some of the Excess Team's major accomplishments since fiscal year 2012 include:

- Processing almost 90,000 items with an acquisition cost of over $128 million.
- A non-Environmental Management Liability savings of more than $14 million.
- More than $5 million in reuse and redistribution of government property within the contractor and to other NNSA/DOE, Federal and State Agencies, and Universities.
- Realizing over $6 million in excess sales revenue.

Major projects worked in the past five years include: Area 2 Cable Yard, Area 24 C3 and A1 Yards, Area 6 Pole Yard, Area 1 Subdock, Area 6 Equipment Yard, 150,000 gallons of mineral oil, Area 6 HVAC Bone Yards, and surface laid cable throughout the NNSS.

"It is an outstanding accomplishment that we're able to rid the NNSS of material that has been sitting in storage for decades – a greater accomplishment still is that we're able to redeploy millions of dollars of property to other agencies for their use and we generated revenue from the disposal," said Craig Mercadante, A&MM Manager. "This effort will ensure we eliminate the environmental liability of continuing to maintain unused materials and also pave the way for future mission growth."

Workers load excess materials on a truck at the NNSS.

Teamwork Leads to Environmental Management Success

NNSS staff check the water quality of samples taken at E Tunnel at the NNSS.

The year 2016 was another banner year for the Environmental Management mission at the NNSS. Close collaboration with NFO organizations and stakeholders was the key to the continued success.

The environmental characterization and remediation services for the NNSS led to multiple significant accomplishments in both the Radioactive Waste Acceptance Program (RWAP) and the groundwater characterization project known as UGTA.

Collaboratively working with NNSS partners and stakeholders –including the public, state and local governments, headquarters and low-level waste generators – was one way NNSS aimed to improve transparency of the Radioactive Waste Acceptance Program (RWAP).

This commitment to transparency was instrumental in updating the Nevada National Security Site Waste Acceptance Criteria (NNSSWAC), which was published in November of 2016. This revision was necessary to align with changes in federal and state regulations/requirements and to enhance the document's clarity. By discussing with and seeking input from stakeholders throughout the process, it opened the door for meaningful dialogue and mutual respect. This open communication resulted in a revised document that retains rigor, is clear, and stresses absolute compliance in order to ensure the protection of workers, the public and environment.

Another achievement for the RWAP team this year was stepping up verification activities at low-level waste generators. NNSSWAC compliance is essential for these DOE and Department of Defense sites around the country. The NNSS RWAP team successfully visited and evaluated all 25 of the approved low-level waste generator sites in 2016, crisscrossing the country to verify that each site is adhering to the strict requirements necessary to send and dispose radioactive waste at the NNSS.

Of note is that two of the RWAP site visits included members of the Nevada Site Specific Advisory Board (NNSAB), a volunteer citizen advisory group tasked with providing recommendations regarding the Environmental Management program. The NSSAB members had the opportunity to enhance their knowledge of the RWAP program, as well as share their perspective with DOE. Such positive interactions strengthen transparency and help maintain NNSS's strong relationships with community liaisons and other stakeholders.

On the remediation side of the NNSA team, are the successes to transition the Frenchman Flat groundwater characterization area to long-term monitoring and close the Double Tracks plutonium dispersal site on Air Force land adjacent to the NNSS. Accomplishment of these major milestones lays the groundwork for NNSS to lead the way for a new year filled with exciting and successful collaborations in 2017.

EMPLOYEE PROFILE

Dawn Peterson

Dawn Peterson loves a challenge. The Closure Support Manager since 2015, Peterson has been contributing to NNSS missions for nearly 20 years.

After receiving a Bachelor of Science degree in Geology from UNLV, Peterson worked as a contractor Task Manager on the Department of Energy Offsites project – cleanup projects located where underground nuclear tests were conducted in Colorado, New Mexico, Mississippi, Alaska, and Nevada (non-NNSS sites). In 2014, Peterson went on to receive a master's degree in Project Management, which is critical to her success in her current role as Closure Support Manager. In this role, Dawn provides direction and oversight for field personnel performing characterization and environmental restoration activities at the NNSS.

From her early start managing the Gnome-Coach investigation in New Mexico to her present work at the NNSS, Dawn, primarily as the site lead/supervisor, has contributed to the remediation and closure of more than 100 contaminated sites regulated by an agreement with the State of Nevada. Peterson's impressive career has also included several years' experience in private and commercial fields in the oil and gas industries.

One of Peterson's most exciting roles was as Site Supervisor for an excavation of an unexploded ordinance landfill on the Tonopah Test Range. The agility of the team overseen by Peterson enabled the work to be completed efficiently and cost-effectively, despite the complicated work of unexploded ordinance remediation.

Another Successful Year Protecting NNSS Assets

Providing protection for some of the nation's most critical assets is a responsibility taken very seriously. Maintaining the security of the NNSS through its long history has always been a demonstration in excellence and service.

In addition to access control and protecting resources, much of the focus on keeping NNSS assets safe centers on security technical services, including installing, repairing, and maintaining the vast and complex security alarm and detection systems for facilities and sensitive material throughout the NNSS and North Las Vegas facility. Security engineers design new systems incorporating evolving technologies while integrating the new capabilities into existing systems.

An example of this was the 2016 effort by protective force and electronic security systems technicians successfully replacing an automatic transfer switch at the DAF. This was a critical infrastructure upgrade for the NNSS, necessary to ensure future programmatic and operational use of the facility. NNSS management applauded the work as an example of the Site's commitment to excellence.

Visibility for the DAF project reached back to Washington, D.C. where NNSA also recognized the Site for its effort. The security contractor's planning and collaboration with the management and operating contractor, vulnerability assessment laboratory, and facility personnel ensured there was no degradation to security or security systems throughout the process. That resulted in a return to the normal security posture on the same day the project was completed.

Ensuring the overall security of the NNSS cannot happen without also always keeping their eye on the welfare of their employees. During the NNSA assessment of their Quality Assurance Program, the team identified three strengths, with the most important being *"very impressed that management focuses on relatively "small" issues regarding employee concerns. As an example, "Through documented employee feedback during training course critiques, management took action to replace simulation munitions protective masks."*

Sustained execution of daily security services operations require extraordinary focus on mission accomplishment. However, that focus also encompasses an attitude that all accidents are preventable, and that every employee is personally responsible for the safe execution of their everyday work. The results of that safety focus cumulated in the security contractor being designated a DOE VPP Star site during their validation visit in May 2016 – a designation sustained by the company since first achieving this honor in 2001.

They also accomplished a rare milestone this year when it surpassed a driving record of over six million miles driven without an at-fault recordable vehicle accident and over one million miles without a preventable vehicle accident. Considering that security vehicles are operated every day of the year over the expanse of a 1,365 square mile site, in all-weather conditions, this is a phenomenal accomplishment.

Year after year, the outstanding security of the NNSS has been recognized through external assessments, customer feedback, and routine interface with our Nevada Enterprise team as consistently providing outstanding performance results, outstanding security services, and outstanding technical and engineering services. Expectations for high performance standards is the norm – and they continue to emulate their corporate motto of "Protecting Critical Priorities."

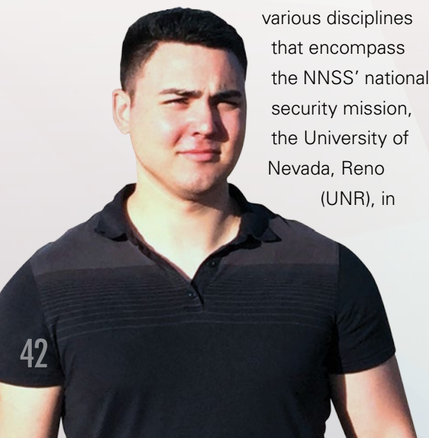
Millennials Shape the FUTURE OF ENGINEERING

Yesterday's workforce has morphed into today's workforce that demands old-fashioned dedication, but with advanced technological, scientific and engineering experience and capabilities. Much of these are dependent upon young scientists and engineers who are excited to work for the NNSS.

Two such employees—Daniel Perlstein and Oscar Pereira—share what it's like to actually do what they've studied in academia, and their impressions of working at such a distinctive place as the Site. The two young men have many things in common: They're patriotic, are awestruck by the Site and its mission, studied (or continue to study) mechanical engineering at the University of Nevada, Las Vegas (UNLV), and love rock 'n' roll.

Daniel Perlstein

In an effort to give mechanical engineering students and professionals work experience in the various disciplines that encompass the NNSS' national security mission, the University of Nevada, Reno (UNR), in conjunction with the Department of Energy (DOE) Packaging Certification Program and support of Argonne National Laboratory, has a Graduate Certificate Nuclear Packaging program. Nuclear packaging is integral to the core missions at the Site. The Graduate Certificate program's first candidate, Daniel Perlstein, a mechanical engineering graduate from UNLV, recently completed all of his courses to become its first recipient.



Working for the NNSS' Infrastructure Management & Modernization (IM&M) Directorate, Daniel's job helped him earn the Graduate Certificate by extending his knowledge in nuclear science. The Graduate Certificate provides a curriculum in packaging for nuclear and other radioactive materials that complements graduate programs in mechanical/materials engineering. It also gives students and professionals an advantage in seeking employment.

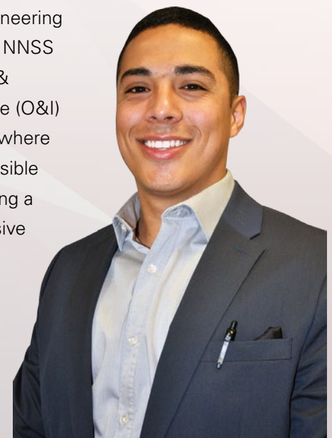
Daniel was responsible for developing and revising fissile material handling and operating procedures for certified Type A Fissile/Type B nuclear packages. He served as a liaison between the NNSS' Certified Packaging Center and each packaging design authority, and was a subject matter expert in support of the Nuclear Material Review Board (NMRB) as required by the Certified Packaging Program Manager. In addition, Daniel had completed the Pressure Change Leak Test required classroom time and 100 hours of hands-on leak test training.

Daniel envisions his work at the NNSS as more than just a job. It's a calling. "My job is important to me because my country is important to me. The field of science and engineering is one of the lifelines of our country's national defense and we can't afford to fall behind our adversaries. There are thousands of military personnel, such as my brother, who put their lives on the line every day to defend our country. Driving the long distance to the Site is the least I can do."

Oscar Pereira

When Oscar Pereira first arrived at Mercury's Gate 100 manned by security police officers, his initial thought was, "This reminds me of a military base. It's so secure, people must be doing critical jobs here."

A former infantry sergeant in the Marine Corps who served in Afghanistan and Southeast Asia, Oscar is now an engineering intern in the NNSS Operations & Infrastructure (O&I) directorate, where he is responsible for completing a comprehensive internship program through UNLV.



Perlstein operates one of the NNSS' leak test machines with co-worker Kuree Price.

Working at both the Site and the North Las Vegas facility, Oscar is assigned to the NNSS' Facilities & Infrastructure Engineering department to assist with the Lead-In Line and Fire Suppression System projects. He has been working on the pipe stress analysis for the final design of the north service lead-in lines. It is a sophisticated analysis that is accomplished by using a comprehensive and advanced software modeling tool called AutoPIPE.

Oscar is most proud of his military experience. A naturalized citizen at age nine from Tegucigalpa, Honduras, Oscar's citizenship allowed him to join the U.S. military, "one of my biggest dreams," he said. He enlisted at age 17, and after completing the Delayed Entry Program, he graduated high school at 18 and soon after began serving with 2nd Platoon, Echo Company, 3rd Light Armored Reconnaissance Battalion. He was deployed in Southeast Asia and Afghanistan for seven months where he was an Infantry Fire team leader and a gunner for a LAV-25-A2 (Light Armored Vehicle). For his service, Oscar received a Navy-Marine Corps Good Conduct medal and a Meritorious Mast, a Letter of Recommendation and two meritorious promotions. He left the Marine Corps with an honorable discharge as an E-5 sergeant in 2013.

Oscar as a U.S, Marine E-4 Corporal in 2011

Oscar's goal now is to learn all he can at the NNSS while studying for his Bachelor of Science degree in mechanical engineering, which he intends to receive this year.

Oscar knew right away he wanted to work at the Site during an employer workshop in UNLV's Engineering department, where the NNSS' Von Sudderth told students about the Site. Sudderth is an active ambassador of sorts for the NNSS, particularly recognizing young talent that would be useful at the Site. Said Oscar after meeting Sudderth, "I knew that the Site was the best fit for me because it relates to the government and my military experience. I was impressed by the Site's progress with science and its need for new people like me in order to grow."

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