

I. National Security Technologies Homeland Security Expertise

National Security Technologies (NSTec) assumed the Nevada Test Site Contract from Bechtel Nevada as the management and operating contractor for the Nevada Site Office of the National Nuclear Security Administration on July 1, 2006. Bechtel Nevada had the contract from 1996. NSTec has 3000 employees (scientists, engineers, logisticians, pilots, technicians, etc.) with FY 2006 funding of \$559 million. Programs include activities on the Nevada Test Site, at the Remote Sensing Laboratory located at Nellis Air Force Base and Andrews Air Force Base, and at the Special Technologies Laboratory in Santa Barbara, California. NSTec emergency responders have been providing national and international support to nuclear emergencies for over 30 years.

The NSTec Homeland Security and Combating Terrorism Mission is to prepare the nation to meet its national security challenges through the application of scientific and technical capability and infrastructure. The mission includes Emergency Response, Technical Field Operations, Applied Technologies, Test and Evaluation, and Training and Exercises.

Emergency Response and Technical Field Operations include Pre-crisis, Crisis, and Consequence Management response; remote data acquisition and analysis; and readiness, technical support, and logistics. Following 9-11, Emergency Response personnel provided support such as radiation detection at the World Trade Center, aerial multi-spectral missions to identify hot spots prior to fire responses at the World Trade Center, and radiological support to several national events. In May 2003, NSTec's forerunner deployed 60 people to the national interagency exercise, TOPOFF II, in Seattle. Activities at the exercise included aerial measurements and Consequence Management Response and Nuclear Radiological Advisory Teams. In the summer of 2005, the Remote Sensing Laboratory (RSL) performed an aerial gamma-ray mapping survey of over 600 square miles over the five boroughs of New York City and adjoining areas of New York State and New Jersey for the NY Police Department funded by DHS. In September 2005, a team from the RSL provided support to the recovery efforts of Hurricane Katrina by providing a team of communications personnel and equipment to the DOE Strategic Petroleum Reserve (SPR) offices. In addition, an aerial survey of the New Orleans area was performed to search for any large radiological sources that may have been displaced by the storm. In August 2006, approximately 80 emergency response members participated in the Southern Crossing Full-Field FRMAC Exercise in Dothan, Alabama. Activities at the exercise included aerial measurements and consequence management responses. In October 2007, approximately 100 emergency response members participated in the TOPOFF 4 Radiological Dispersal Device exercise, with majority of participants supporting aerial measurements and consequence management response at the Portland, Oregon location.

Applied Technologies includes infrastructure protection and security systems; development and fielding of motion sensing and advanced optical and multi-spectral capabilities in support of augmented vision and detection technologies; imagery collection/analysis and data fusion; training and in-field technical support; and weapons

of mass destruction materials detection and characterization instruments. As an example the Detection and Tracking System, developed jointly with Lawrence Livermore National Laboratory and demonstrated at Fort Leonard Wood, is an array of sensors networked through wireless communications to a command center and used to detect, identify, and track radiological and nuclear material traveling on roads and highways.

Test and Evaluation includes controlled releases of hazardous chemicals and biological simulants for hazardous materials research, development, testing, and training; field experimentation and applications for explosives testing and evaluation; and counterterrorism and emergency response sensor evaluation. In January 2004, DHS committed to establishing the DHS Radiological/Nuclear Countermeasures Test and Evaluation Complex (Rad/NucCTEC) at the Nevada Test Site. The Testing and Evaluation Complex, as currently conceived, is comprised of the following testing venues:

1. a traffic lane portal
2. an “active interrogation” facility which will make possible the evaluation of the latest detection technologies that have the capacity to intrusively interrogate trucks and/or transportainers, enhancing the sensitivity of detection for nuclear materials and overcoming the effects of materials that can shield the presence of nuclear materials
3. adequate space within the “active interrogation” facility for testing baggage, international mail, and international cargo screening.

Training and Exercises includes support for training and exercises for state and local first responders onsite and offsite; operational readiness exercises for military units; and technologies for intelligence, counterterrorism, special operations, law enforcement, and weapons-physics studies. NSTec is building a comprehensive, fully integrated system of facilities and capabilities at the Nevada Test Site to conduct training and exercises in a variety of complex scenarios and to test new technologies under realistic conditions. As of the present, three DHS Testing and Evaluation campaigns, Advanced Spectral Portal Monitors (ASP), Anole and Bobcat, have been conducted at the Nevada Test Site during the planning and construction of the Rad/NucCTEC. From FY1999 through FY2007, approximately 45,000 first responders were trained by NTS personnel to respond to weapons of mass destruction.

II. Descriptions of Positions

NSTec Education Coordinator: Stephen Mitchell, Ph.D., mitchese@nv.doe.gov
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Las Vegas, Nevada

Shimmering from the desert haze of Nevada like a latter-day El Dorado, Las Vegas is the most dynamic, spectacular city on earth. At the start of the twentieth century, it didn't even exist; at the start of the twenty-first, it's home to well over one million people, with enough newcomers arriving to need a new school every month. "The Entertainment Capital of the World" welcomes 35 million people a year. Visitors love to enjoy luxurious hotels, unique shopping experiences, dazzling and unusual stage shows, first rate restaurants, and world class gaming. Of course, Las Vegas is also a golfer's paradise, with plenty of championship golf courses. Away from the man-made excitement is a world of natural beauty unlike any other place on earth. Red Rock Canyon's unique rock formations are perfect for both the photographer and the rock climbing enthusiast. Mt. Charleston offers hiking, skiing, camping and all the wonderful sensations of the High Sierras. Lake Mead is perfect for water sports. The Grand Canyon, Valley of Fire, and Death Valley are all short hops from the Strip

www.lasvegas.com

1. Project: Support for Nuclear Instrument Test and Evaluation

Contact: Gary Chilton, chiltogl@nv.doe.gov, (702) 295-2553, Manager,
Radiological/Nuclear Test and Evaluation Project.

Project Description: The DHS mission includes the near-term evaluation of commercial-off-the-shelf (COTS) radiation detection equipment as well as the R&D, design and production of intrinsically superior systems to protect the country. Operational Test and Evaluation is necessary both to validate the selection of COTS and as a process throughout the conception, design, production, and fielding of new systems. Interns can contribute by participating in test and evaluations of instrumentation that is expected to take place this year. Interns will work with scientists and engineers in the project office in Las Vegas and will also spend time at the Nevada Test Site, located approximately 65 miles north of Las Vegas.

Qualifications: Strong background in either the physical sciences or applied mathematics.

Keywords: Radiation detection, radiation measurements, field data acquisition, and data analysis.

2. Project: Design, Layout and Programming of New Radiological Instruments

Contact: Craig Marianno, Ph.D., mariancm@nv.doe.gov, (702) 794-1638,
Manager, Nuclear Instrumentation, Remote Sensing Laboratory-Nellis.

Project Description: The Nuclear Technology Section of the Remote Sensing Laboratory is transitioning some of its nuclear detection systems from analog circuitry to Digital Signal Processors. Development of these systems will require an intern to work in

the Las Vegas facility and help develop software codes and related electronic circuitry. Interns will have the opportunity to contribute to the design methodology and layout of the system and will work under the direction of senior scientists and engineers. They will have the opportunity to see their contributions implemented into prototypes and operating devices. Interns will work with scientists and technicians at the Remote Sensing Laboratory located on Nellis Air Force Base near Las Vegas.

Qualifications: A strong engineering or physical science background with hands-on instrument development and programming experience is strongly suggested.

Keywords: Radiation detection, signal processing, and electronic layout

3. Project: Modeling and Testing of Radiological Instruments and Measurements Techniques

Contact: Carson Riland, Ph.D., Rilandca@nv.doe.gov, (702) 794-1016, Chief Scientist, Remote Sensing Laboratory-Nellis.

Project Description: The Remote Sensing Laboratory is responsible for maintaining readiness of personnel and equipment for national and international response to incidents involving radiological material. The laboratory has a training and exercise development program, performs instrument calibration and maintenance, and develops new methodologies for data collection and analysis to protect the public in the event of a radiological accident. Radiation detection systems range from small hand-held units to vehicle-based systems to helicopter and fixed-wing systems. Interns can contribute through both mathematical modeling of new detector designs, and development and beta testing of new data collection and assessment methodologies. Interns will work with scientists and technicians at the Remote Sensing Laboratory located on Nellis Air Force Base near Las Vegas.

Qualifications: Strong background in either the physical sciences, engineering or applied mathematics. A basic knowledge of nuclear physics and radiation interactions would be useful.

Keywords: Radiation detection, radiation measurements, mathematical modeling and conceptual design, field data acquisition, and data analysis.

Washington, DC

From the gleaming Capitol to the Washington Monument towering over the Mall, the White House to the Library of Congress, the Smithsonian museums and art galleries to the quaint neighborhoods nestled throughout the District's four quadrants, DC offers something for everyone. From its iconic monuments and buildings to its historic neighborhoods and free museums, the capital of the United States offers many interesting attractions. A tour of the White House Visitor's Center brings a wealth of information about one of the most powerful symbols of American history and politics. There are a number of moving tributes, including the Vietnam War Memorial, the Jefferson

Memorial and the Lincoln Memorial. D.C. is especially known for its museums. From the Holocaust to the history of space exploration and from dinosaurs to international spies, there is a museum for almost every area of interest, with many offering free admission. Great shopping, restaurants and Colonial architecture can be found in Georgetown. And The Mall, a slice of greenery in the center of town surrounded by the buildings of the Smithsonian, is the perfect place to grab a hot dog, relax and take in the sights and sounds of this lively and influential city. Washington is the ideal city to visit to get a sense of the diversity and historic wealth of our country.

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4. Project: Pedestrian Mapping:

Contact: Timothy Ashenfelter, Ph.D., Phoenika@nv.doe.gov, (301) 817-3411, Sr. Scientist, Scientific Services Section, Remote Sensing Laboratory-Andrews.

Project Description: A summer research and development opportunity in radiological mapping project is available at the Remote Sensing Laboratory-Andrews (Washington D.C. area) for the summer of 2008. The project supports an advanced and important pedestrian-based radiological mapping capability which is used by multiple emergency response teams for survey and search. The work involves implementing advanced signal analysis algorithms as well as field tests for this state-of-the-art. The applicant can contribute to the MATLAB software acquisition, algorithms for advanced analysis applications, and/or the field testing. This project will provide a rare opportunity for the intern to experience the full range in the R&D process from creating software applications to designing field tests to analyzing field data. During this time, the intern will also have the opportunity to learn and assist on RSL-A's work on aerial systems, portal/mobile radiation systems, and emergency response. Specifically, the advanced pedestrian mapping system construction will be patterned similarly to the aerial system that is being designed for our helicopter and fixed wing mapping systems.

Qualifications: A strong technical background in engineering, physics, mathematics, electronics, or software development is strongly suggested.

Keywords: Emergency response, radiation detection, position tracking, mapping

5. Project: Advanced Detector Design for Homeland Security

Contact: Kevin Phoenix, Ph.D., Phoenika@nv.doe.gov, (301) 817-3365, Manager, Scientific Services Section, Remote Sensing Laboratory- Andrews.

Project Description: A summer research and development opportunity in radiation detector design is available in the Washington D.C. area at the Remote Sensing Laboratory-Andrews for the summer of 2008. The summer research work will entail working closely with several scientists and engineers on the acquisition software and hardware for an advanced dual portal/vehicular directional detection system. The student will have the opportunity to contribute to advanced technological solutions to the prototype systems, but also to participate in the field tests.

Qualifications: A strong technical background in engineering, physics, mathematics, electronics, or software development is strongly suggested.

Keywords: Emergency response, radiation detection, data acquisition, software development

6. Project: Aerial Measuring Systems applications

Contact: Kevin Phoenix, Ph.D., Phoenika@nv.doe.gov, (301) 817-3365, Manager, Scientific Services Section, Remote Sensing Laboratory- Andrews.

Project Description: The Remote Sensing Laboratory at Andrews AFB fulfills a significant emergency response role for the Federal Government. The AMS (Aerial Measurement System) provides the federal government with detailed plots of radiological material that has been released to the environment in the event of a radiological emergency. A summer internship opportunity is available for a student to work on the software analysis and acquisition software for a state-of-the-art aerial radiation mapping system that is being developed at the Remote Sensing Laboratory-Andrews (Washington D.C. area). The work will involve the implementation of advanced spatial mapping techniques on a large aerial system for use by the aerial emergency response mission team. This research opportunity will likely involve software programming in MATLAB, but also field testing and evaluation. RSL-A system will be tested on our fixed wing and helicopters during the summer of 2008. The AMS capability also exists at RSL-Nellis.

Qualifications: A strong technical background in engineering, physics, mathematics, electronics, or software development is strongly suggested.

Keywords: Emergency response, radiation detection, aerial measurements, environmental monitoring

Santa Barbara, California

Santa Barbara is located 90 miles northwest of Los Angeles, and is bordered by the Santa Ynez Mountains and Pacific Ocean. Nick-named the American Riviera, Santa Barbara offers beautiful views, and opportunities for outdoor activities including surfing, ocean kayaking, scuba diving, cycling, and hiking. The Special Technologies Laboratory is approximately two miles from the University of California at Santa Barbara, home to several nationally acclaimed Institutes, including the Material Research Laboratory, known as the best in the nation.

For more information about Santa Barbara's offerings see:

<http://www.totalsantabarbara.com/sea.shtml>

7. Project Title: Handheld Explosives Detector

Contact: Stephan Weeks, weekssj@nv.doe.gov, 805-681-2262, NSTec Special Technologies Laboratory, Santa Barbara, CA.

Project Description:

Real-time detection of explosives is critical to Homeland Security. The objective of the project is to develop a systems-engineered handheld detector for non-nitro based explosives. The system utilizes a general explosives detector (e.g., IMS) to trigger automated preconcentration followed by fast gas chromatograph detection for specific explosive compound detection. Data analysis and visual information displays are critical. A multi-disciplinary team is available to enhance all aspects of the system:

- Sensor technologies - testing and understanding complementary nature of multi-sensor approaches as they apply to specific field applications;
- Sample collection - providing representative sampling;
- Systems engineering - minimizing size, power, maintenance needs, etc.;
- Software development – providing remote operations control and decision support software;
- Field testing – T&E at NSTec/STL and NTS.

Qualifications: Analytical or physical chemistry; electronic, statistical or computer engineering; or physics, with expertise in one or more of the following: sensor development and testing, field sampling, systems engineering, field systems data acquisition and analysis.

Keywords: Explosives detection, fast gas chromatography, mobility spectrometry.

8. Project Title: Conjugated Polymers for Neutron Detection

Contacts: Clare Kimblin, kimblicw@nv.doe.gov, 805-681-2257, NSTec Special Technologies Laboratory, Santa Barbara, CA.

Project Description:

We are researching conjugated polymers as new materials for neutron detection with the hope that they might be suitable for large area detectors. Optical and electronic properties of commercially available as well as suitably substituted novel conjugated polymers are being explored in order to improve current neutron detection capabilities.

This internship would involve exploring one of three areas which exploit conjugated polymers for neutron detection: 1.) Optical properties of high neutron cross-section luminescent conjugated boron-rich polymers composed of both the neutron converter and alpha track indicators (scintillator). 2.) The use of semiconducting polymer devices

containing ¹⁰B for neutron sensing. Conjugated polymer semiconductors are easier to fabricate than traditional semiconductors and advances in printing electronics may one day permit fabrication of lightweight, flexible/formable and scaleable plastic neutron sensors. 3.) Change in conductivity of conducting polymer wires in the presence of an alpha or neutron source.

Aspects of this multi-disciplinary project involve:

- A background in Materials engineering and Polymer development.

- Electrical engineering for fabrication and testing of semiconducting and optical properties.
- Device design for creation of polymer blends and neutron converter materials.
- Device testing – in the presence of alpha or neutron flux.

Keywords: Neutron detection, conjugated polymer, semiconductor, materials, chemistry.

III. Schedule

We are willing to work with the students to find an agreeable time within the window.

IV. Integration of Students into the Community and Housing Considerations

Students will be welcomed to all employee functions. Mentors will help students find recreational opportunities in the neighborhood. Las Vegas, Santa Barbara, and the area near Andrews Air Force Base (Greater Washington, DC) have a wide range of housing options. The NSTec Education Coordinator will work with the students through the local resource centers to identify options for housing; e.g., shared housing. A housing subsidy of up to \$1000.00 per month has been granted for the last two years and we are anticipating a similar subsidy being available for this summer.