New Mexico State University

ARROWHEAD CENTER

LEADING ECONOMIC DEVELOPMENT FOR NEW MEXICO STATE UNIVERSITY

Test and Demonstration Assets of New Mexico

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NM STATE UNIVERSITY

Live, Learn and Thrive

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1.0 INTRODUCTION

The National Nuclear Security Agency (NNSA) has the general responsibility to protect the USA nuclear weapons assets. In addition, the following mission elements exist for the NNSA (NNSA Strategic Plan, 2004):

1. To enhance United States national security through the military application of nuclear energy.
2. To maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements.
3. To provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants.
4. To promote international nuclear safety and nonproliferation.
5. To reduce global danger from weapons of mass destruction.
6. To support United States leadership in science and technology.

The NNSA has a variety of active programs to support its mission. A new program, National Security Preparedness Project (NSPP), is in part represented by this document. New Mexico State University (NMSU) is under contract to support the migration of technology, especially small business technology, to the support of the NNSA mission. In general, the NSPP has three primary components described in the following text:

1. Business incubation of security technology companies: Business incubation program for small business with technologies applicable to national security. The incubator companies will receive hands-on mentoring in general business matters and in addition will receive assistance with marketing and the security technology domain.
2. Workforce development: The NSSA has challenges with their workforce as do many other Federal organizations. Workforce development is a critical issue that the NNSA faces as well as emerging security businesses.
3. Technology Demonstration Validation (DEMVAL): Demonstration and validation of national security technologies created by incubator sources, as well as other sources, are critical phases of technology development. The NSPP will support the creation of an integrated demonstration and validation environment.

The third is a focus on technology. Each of these three components supports a variety of the NNSA mission areas such as responsive infrastructure and technology as part of the NNSA New Triad as well as counterterrorism and other mission areas.

This document supports the first goal of the DEMVAL portion of the NSPP. An assessment of the Federal, state, and private DEMVAL related infrastructure has been compiled. Eventually this information, in a synthesized form, will be provided to businesses with security technology products and R&D. The synthesized form will include a match between facilities and NNSA requirements.

The methodology to gather data on DEMVAL assets involved internet searches, catalog searches, and phone calls. The priority in the first document was to capture DEMVAL facilities with less importance on NNSA precise match. The next assessment document will have a greater focus on exact NNSA requirements match.

2.0 TABLE DESCRIPTION

A variety of categories of asset elements are shown in the following tables. Within each table, an organization or location in New Mexico has been identified and its capabilities are listed.

The following template contains the layout for the table:

The first column contains the complex that is the organization. The next column contains the test and evaluation (T&E) facilities that all of the complexes for this table are matched against. The T&E parameters are the columns containing the Xs. This initial assessment in summary matches complex/organization for each T&E parameter. The T&E category (or table type) lists multiple individual facilities for each complex/organization when appropriate. These 12 tables have additional information in Section 3.0 that is relevant by complex.

		Different types of testing available							
Complex	Facility								

Table 1. Space Operations Testing and Evaluation Facilities

Complex	Space Operations Testing and Evaluation	Flight Operations and/or Training	Hazardous Materials	Guidance and Navigation	Launch Systems	Satellites and Nanosatellites	Planetary Physics and Technology	Nuclear Propulsion Systems	Space Materials
Kirtland	Space Development Test Wing (Group)	X		X					
	Space Test Group	X							
Los Alamos National Laboratories	Center for Space Science and Exploration							X	X
	Institution of Geophysics and Planetary Physics						X		
NASA	White Sands Test Facility	X	X		X			X	X
New Mexico Tech	Institute for Engineering Research and Applications						X	X	
	National Radio Astronomy Observatory						X		
New Mexico State University	RioRoboLab								X
	Twenty-first Century Space and Aerospace Cluster			X		X	X		X
University of New Mexico	Institute for Space and Nuclear Power Studies							X	
	Institute of Meteoritics						X		

Table 2. Propulsion, Fuel, and Launch Systems Testing and Evaluation Facilities

Complex	Propulsion, Fuel, and Launch Systems Testing and Evaluation	Propellant Systems	Rocket Propulsion	Oxygen Systems	Combustion Systems
White Sands Missile Range	Analytical Chemistry Laboratory	X	X		X
Private Sector	Aerojet	X	X	X	X
Sandia National Laboratories	Combustion Research Facility				X
NASA	White Sands Test Facility	X	X	X	

Table 3. Aviation and Flight Systems Testing and Evaluation Facilities

Complex	Aviation and Flight Systems Testing and Evaluation	Aerodynamics and Aeronautical Engineering Systems	Autonomous Vehicle Control	Aviation Testing and Evaluation	Aircraft Maintenance Systems	Jet Engines	Avionics	Simulation	Safety
Private Sector	Boeing SVS	X		X		X	X		
Private Sector	GE Aviation	X				X	X		
Private Sector	Goodrich Corporation	X			X	X	X		
Private Sector	Honeywell Aerospace	X		X					X
Kirtland	505th Distributed Warfare							X	
	Air Force Operational Test and Evaluation Center	X		X					
	Air Force Safety Center				X				X
	Space Development Test Wing	X		X				X	
New Mexico State University	RioRoboLab				X				
	Threat Reduction Capabilities Cluster		X						
	UAS Flight Test Center		X	X			X	X	X
	UAS Technical Analysis and Applications Center		X	X			X	X	X
Private Sector	Raytheon		X						
White Sands Missile Range	Electromagnetic Testing Facilities Cluster								X
	Electronic Warfare Cluster							X	X

Table 4. Materials Technology Development Testing and Evaluation Facilities

Complex	Materials Technology Development Testing and Evaluation	Particle Acceleration	Super Conductivity	Cryogenics	Semiconductors	Ceramics	Synthesis	Materials Science	Actinide Research
Los Alamos National Laboratory	Los Alamos Neutron Science Center	X						X	X
	The Seaborg Institute								
	The Superconductivity Technology Center		X	X				X	
New Mexico State University	Electrical & Computer Engineering Cluster	X			X				
Sandia National Laboratories	Ion Beam Materials Research Laboratory	X			X	X	X	X	
	Materials and Process Diagnostics Facility						X	X	
	Plasma Materials Test Facility							X	
University of New Mexico	Center for Micro Engineered Materials					X			
	Institute for Space and Nuclear Power Studies						X	X	
White Sands Missile Range	Analytical Chemistry Laboratory								
	Metallurgy Laboratory						X	X	X

Table 5. Offensive Weapons Systems Testing and Evaluation Facilities

Complex	Offensive Weapons Systems Testing and Evaluation	Nuclear Weapons Systems	Air Defense Ranges	Small Arms Ranges	Large Ordnance Ranges	Energetic Materials	Arms Control	Bomb, Missile and Submunition Testing	Hazardous Materials
Kirtland	Defense Threat Reduction Agency					X	X		
	Nuclear Weapons Center	X				X	X		
Los Alamos National Laboratories	The Superconductivity Technology Center					X			
New Mexico Tech	Energetic Materials Research and Testing Center				X	X			
New Mexico State University	Threat Reduction Capabilities Cluster	X				X	X		
White Sands Missile Range	Aerial Cable Facility				X			X	
	Dynamic Testing and Facilities							X	X
	Electromagnetic Testing Facilities	X							
	Warhead Testing	X		X	X				

Table 6. Physical Science Evaluations and Testing Facilities

Complex	Physical Science Evaluations and Testing	Thermodynamic	Geophysical	Fluid Mechanics	Micro Mechanics	Acoustics	Chemical	Explosives	Hazardous Materials
Los Alamos National Laboratories	Institution of Geophysics and Planetary Physics		X						
New Mexico Tech	Bureau of Geology and Mineral Resources		X	X					
	Institute for Engineering Research and Applications	X							
	Playas Training and Research Center							X	
Sandia National Laboratories	Engineering Sciences Experimental Facilities	X	X	X	X				
	Sandia's Orpheus Site					X			
	Shock Thermodynamic Applied Research Facility	X							
University of New Mexico	Incorporated Research Institutions for Seismology		X						
White Sands Missile Range	Aerial Cable Facility						X		X
	Certified Chemistry Laboratory	X					X		X

Table 7. Energy Systems and Properties Testing and Evaluation Facilities

Complex	Energy Systems and Properties Testing and Evaluation	Magnetic-Pulsed Fields	Rechargeable Technology-Batteries	Solar/Thermal	Radioactivity/Reaction/Fuel	Photo Voltaic	Power Sources
Los Alamos National Laboratories	National High Magnetic Field Laboratory	X					
Sandia National Laboratories	Advanced Battery Research Engineering and Evaluation		X				
	National Solar Thermal Test Facility			X			X
	Nuclear Facilities Resource Center				X		X
	Photovoltaic Laboratories					X	
	Pulsed Power and Systems Validation Facility	X					
University of New Mexico	Institute for Space and Nuclear Power Studies				X		X
White Sands Missile Range	Electromagnetic Testing Facilities	X					

Table 8. Communication and Information Security Systems Testing and Evaluation Facilities

Complex	Communication and Information Security Systems Testing and Evaluation	Integrated Homeland Security Systems	Integrated Intelligence Security and Linguistics	Electronic Defense	Near and Deep Space Communication	Surveillance and Reconnaissance	Situational Management
Private Sector	Applied Research Associates, Inc.	X					
New Mexico State University	Information Sciences and Security Systems Cluster	X			X		
	Physical Science Laboratory		X			X	X
	RioRoboLab	X		X		X	
	Threat Reduction Capabilities Cluster		X				X
Private Sector	Northrop Grumman		X			X	
Private Sector	Raytheon	X	X				
Sandia National Laboratories	Center for Security Systems			X			
University of New Mexico	Center for High Performance Computing	X		X			
White Sands Missile Range	Electronic Warfare Cluster			X			
	Information Operations Laboratory		X				

Table 9. Physical Security, Detection and Monitoring Systems Testing and Evaluation Facilities

Complex	Physical Security, Detection and Monitoring Systems Testing and Evaluation	Physical Security Monitoring: Cameras, and Sensing	Entry Control and Alarms	Biological Weapons Sensing and Threat/Risk Evaluation	Bioinformatics and Biometric Sensing and Monitoring	Precision Measurement and Calibration	Pulsed Power Detection
Private Sector	Mesosystems Technology			X	X		
New Mexico Tech	Institute for Engineering Research and Applications						X
New Mexico State University	Bioscience Cluster			X	X	X	
	Physical Science Laboratory	X		X	X		X
	RioRoboLab	X					
Private Sector	QTL Biosystems			X	X		
Sandia National Laboratories	Center for Security Systems	X	X				
	Radiation Detector Analysis Laboratory			X			

Table 10. Emerging Technologies Testing and Evaluation Facilities

Complex	Emerging Technologies Testing and Evaluation	Nanoscale Mechanics	Photometric and Optics	Electronic Data Acquisition	Complex and Nonlinear Systems	Robotics	Nanotechnology	Environmental Simulation
Private Sector	Krestel		X					
Los Alamos National Laboratories	Center for Integrated Nanotechnologies						X	
	LANL- Nonlinear Studies				X			
New Mexico State University	Electrical & Computer Engineering		X					
	Information Sciences and Security Systems Cluster			X		X		
Sandia National Laboratories	Center for Security Systems		X	X		X		X
	Intelligent Systems and Robotics Center					X		
University of New Mexico	Center for High Technology Materials		X	X			X	
	Center for Micro Engineered Materials	X					X	
White Sands Missile Range	Electronic Warfare Cluster			X				

Table 11. Air and Ground Based Sensors Facilities

Complex	Air and Ground Based Sensors	Resolution	Range	SWOP	Data Transmission	Packaging	Networks	Countermeasures and Warning Devices
New Mexico State University	Threat Reduction Capabilities Cluster		X		X			
	Physical Science Laboratory		X	X				
	Electrical & Computer Engineering Cluster				X		X	
	RioRoboLab	X						
University of New Mexico	Center for Rapid Environmental Assessment and Terrain Evaluation	X	X		X	X	X	
White Sands Missile Range	Aerial Cable Facility							X

Table 12. Climatic Testing Facilities

Complex	Climatic Testing	Data Acquisition	Hazardous Materials Testing	Microbiological Testing	Elemental Testing
White Sands Missile Range	Climatic Test Facility	X	X	X	X

3.0 DEMONSTRATION ASSETS DESCRIPTION

Section 3.0 contains detailed descriptions for each of the organizations contained in the complex column in the tables in Section 2.0. Generally the name of the organization is listed, followed by a general citation, next the narrative description and then an indication of whether additional detailed information is included for specific T&E organizations (column 2, Section 2 tables). The same format is followed for the T&E organizations, but, in addition, a point of contact is included when available.

The overall order for the complexes is Federal, state, then private organizations in New Mexico.

3.1 LOS ALAMOS NATIONAL LABORATORY

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/

Los Alamos National Laboratory (LANL) is a leader in national security research, confronting problems facing the nation with engineering and scientific solutions. Los Alamos National Labs continuously works to guarantee the safety, security, and reliability of the nation's nuclear deterrent.

Research facilities located at Los Alamos National Laboratory:

3.1.1 Center for Integrated Nanotechnologies

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/cint/

The Center for Integrated Nanotechnologies is one of only five such institutions in the U.S. It operates as a national user facility devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials.

The center aims to lead the current revolution in nanotechnology, contributing to DOE's main operations in national defense, energy, and the environment while providing useful resources for universities and industries.

Contact
Bob Hwang, Director, Sandia
Phone: 505.844.8402
FAX 505.284.7778
rqhwang@sandia.gov

3.1.2 Center for Space Science and Exploration (CSSE)

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/science/centers/csse/

The Center for Space Science and Exploration is dedicated to promoting space science and exploration. The focal points are studying the biological effects of long-term space travel, investigating possibilities of extraterrestrial life, advancing nuclear power for propulsion systems, and developing alloys and other materials for use in space.

Contact
Herbert Funsten, Director
505.665.4314

3.1.3 Los Alamos Neutron Science Center

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://lansce.lanl.gov/

As the major experimental science facility at Los Alamos National Laboratory, the Neutron Science Center is a world-renowned facility. One of the major assets contained within the center is a powerful linear accelerator that can accelerate protons to 84% the speed of light. This type of acceleration is used in a wide variety of applications, and helps the nation maintain its frontrunner role in science and technology.

Research at the Neutron Science Center assists in the nation's goal of nonproliferation by countering the spread of weapons of mass destruction. In addition to its leadership role in national security, the Neutron Science Center also lays the foundation for a variety of products used in everyday life in the realms of technology and materials sciences.

Contact
Ginger Grant, Executive Assistant
ggrant@lanl.gov

3.1.4 Nonlinear Studies

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/science/centers/cnls/

The Nonlinear Studies Center conducts and supports basic scientific research in nonlinear and complex systems and promotes their use in applications of research programs.

At any given time, the Nonlinear Studies Centers focuses on two or three topics in strategically important areas. An executive committee determines the focuses by taking into account LANL's current needs for basic science relevant to mission-critical programs.

The committee also carefully considers emerging developments' potential in complex systems research to maintain the laboratory's status as one of the world leaders in applied scientific research.

Contact
Center for Nonlinear Studies Office
Phone: 1-505-667-1444
Fax: 1-505-665-2659
office@cnls.lanl.gov

3.1.5 Institute of Geophysics and Planetary Physics

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/science/centers/igpp/

The Institute of Geophysics and Planetary Physics is devoted to promoting and supporting superior cutting-edge applied science in the areas of astrophysics, space physics, solid planetary geoscience and complex dynamical earth systems. The institute also selects additional focus areas based on current scientific challenges facing the international community, as well as based on the need to keep LANL at the forefront of world research and promote excellence in its field.

Contacts
Gerald Geernaert, Center Leader
(505) 667-6020

Deb Rivera, Admin. Assistant
(505) 667-0920

3.1.6 National High Magnetic Field Laboratory

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/orgs/mpa/nhmfl/

The Pulsed Field Facility located at Los Alamos National Laboratory is one of three locations of the National Nigh Magnetic Field Laboratory throughout the country. The New Mexico location is endowed with unique resources, including a 1.4 GVA inertial storage motor-generator for high field pulsed magnet. In addition, located at Los Alamos are 60 Tesla Long Pulse Magnets powered by the motor generator and capacitor driven pulsed magnets.

The NHMFL maintains a user facility open to all qualified users. The laboratory also researches and develops magnet technology with the private sector to promote advancement in science and technology in high magnetic fields.

Contacts
Marcelo Jaime, Center Leader
(505) 667-7625

Julie Gallegos, Program Admin.
(505) 665-9039

3.1.7 Seaborg Institute

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://seaborg.lanl.gov/

The Seaborg Institute branch located at Los Alamos conducts research programs on the chemical, physical, nuclear, and metallurgical properties of actinides. The center is a premier national center for educating students, scientists, and faculty at all levels of transactinium science.

Contact
ramsay@lanl.gov
Phone: 505-665-7214
Fax: 505-665-7895

3.1.8 Superconductivity Technology Center

(2008). Los Alamos National Laboratory: National Security Science. Retrieved February 4, 2008, from http://www.lanl.gov/orgs/mpa/stc/index.shtml

The Superconductivity Technology Center hosts a multidisciplinary research-development program aimed at the technology transfer of high-temperature superconductivity. The focus of the Center is to collaborate with industries related to conductivity, as well as universities and other national laboratories to develop power and electronic-device applications of high-temperature superconductors.

Areas of applied scientific research include powder synthesis, tape/coil processing, thin/thick film deposition, characterization of microstructural and superconducting properties, power cryogenic engineering, and prototype devices.

Contacts
Dean Peterson, Center Leader
dpeterson@lanl.gov

Ken Marken, Deputy Center Leader
kmarken@lanl.gov

3.2 NASA, White Sands Test Facility

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from the NASA WSTF Web site http://www.wstf.nasa.gov/

White Sands Test Facility (WSTF), located in southwestern New Mexico, is one of the world's premium rocket engine test facilities, primarily used for testing and evaluating potentially hazardous materials, space flight components, and rocket propulsion systems. The test facility provides these services not only to NASA and the Department of Defense, but also to universities and commercial industries involved in research and development of national-security related technologies.

3.2.1 Chemical and Physical Properties of Materials

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.wstf.nasa.gov/Chem/Default.htm

Engineers and chemists utilize state-of-the-art laboratories to test hazardous materials, as well as propellants, air quality, aerospace hardware and ground support equipment. White Sands Test Facility also strives to improve all materials, components, and systems involved in manned space flight.

3.2.2 Hazards Assessment

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.wstf.nasa.gov/Hazard/Default.htm

Much of the testing that takes place at WSTF is involved with the assessment of hazardous materials. The facility's laboratories also possess the capabilities to conduct hypervelocity tests. The

High Energy Blast Facility assesses explosive hazards, and routinely tests solids, cryogenics, hypergolic propellants, and many other types of high explosives.

3.2.3 Oxygen Systems

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.wstf.nasa.gov/oxygen/default.htm

In the presence of high concentrations of oxygen, combustion becomes a critical issue concerning safety in space, aircraft, medical, and industrial applications. Experts from the facility perform hazards analyses on materials, components, and entire systems, and, in the event of a failure, different analyses are performed to determine the cause of fires. WSTF also provides training courses about design and operation of safe oxygen systems.

3.2.4 Space Flight Hardware

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.wstf.nasa.gov/FltHardware/Default.htm

Located at WSTF, the Propulsion Component Test Facility is an Orbiter and International Space Station Depot Repair Facility. Specialists assemble and repair hardware specific to flight, as well as perform acceptance testing for private aerospace manufacturers.

In addition to research and development, WSTF also refurbishes hypergolic propellant components for space shuttles and performs pyrovalve failure investigations.

3.2.5 Launch and Landing Support

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.wstf.nasa.gov/WSSH/Default.htm

White Sands Space Harbor, located at the facility, is the main training ground for space shuttle pilots practicing approaches and landing in shuttle-training aircraft and T-38. In addition to being a training area, the runways, navigational aids, runway lighting, and control facilities are always ready as a backup shuttle-landing sight.

3.3 KIRTLAND AIR FORCE BASE

(2008). NASA White Sands Test Facility. Retrieved February 4, 2008, from http://www.kirtland.af.mil/

(2008).Kirtland Air Force Base/ Directory – Units. Retrieved March 10, 2008, from http://www.united-publishers.com/kirtland/units2.html

3.3.1 505th Distributed Warfare

(2008).Kirtland Air Force Base/ Directory – Units. Retrieved March 10, 2008, from http://www.united-publishers.com/kirtland/units2.html

The 505th Distributed Warfare Group's mission is to provide high-fidelity theater synthetic battlespaces and world-class exercise control to support joint distributed warfighter training, testing, and experimentation across the operational and tactical levels of war.

This training is accomplished through Blue Flag exercises executed by the 505th Combat Training Squadron, Hurlburt Field, Florida, and Virtual Flag exercises at the 705th Combat Training Squadron in New Mexico.

The Blue Flag exercise trains the team and warfighters at the operational level of war and provides professional exercise control for joint training and a realistic synthetic environment. Blue Flag also provides professional exercise planning and support conducted for Air Force, joint, and combined exercises.

3.3.2 Air Force Safety Center

(2008). Air Force Safety Center. Retrieved March 10, 2008, from http://usmilitary.about.com/od/airforce/l/blsafetycenter.htm

The Air Force Safety Center develops and manages Air Force mishap prevention programs and the Nuclear Surety Program. It develops regulatory guidance, provides technical assistance in the flight, ground and weapons and space safety disciplines, and maintains the Air Force database for all safety mishaps. It oversees all major command mishap investigations and evaluates corrective actions for applicability and implementation Air Force wide. It also develops and directs safety-education programs for all safety disciplines.

3.3.3 Air Force Operational Test and Evaluation Center

(2008). Air Force Operational Test and Evaluation Center. Retrieved March 10, 2008, from http://www.afotec.af.mil/

The Air Force Operational Test and Evaluation Center is a direct reporting unit under Headquarters, U.S. Air Force. It is the Air Force independent test agency responsible for testing, under operationally realistic conditions, new systems being developed for Air Force and multi-service use. The commander of the Air Force Operational Test and Evaluation Center reports directly to the Air Force Chief of Staff.

The Air Force Operational Test and Evaluation Center is the Air Force agency responsible for planning, executing, and reporting independent operational tests and evaluations. The agency determines the operational capabilities and limitations of Air Force and joint systems to meet warfighter mission needs. It provides operational effectiveness, suitability and evaluation expertise from concept development to system employment in support of Air Force, DoD, and other government agencies.

Contact
Assistant Chief of Staff
Phone: (505) 846-8892

3.3.4 Space Development Test Wing

(2008).Kirtland Air Force Base/ Directory – Units. Retrieved March 10, 2008, from http://www.united-publishers.com/kirtland/units2.html

The Space Development and Test Wing performs development, test, and evaluation of Air Force and Department of Defense space systems; executes advanced space development and

demonstration projects to exploit new concepts and technologies, and rapidly migrates capabilities to the warfighter.

Space and Missile Systems Center Space Development and Test Wing serves as the primary provider of launch capability, space flight, and on-orbit operations for the entire DoD space research, development, test, and evaluation community. SDTW is responsible for the Rocket Systems Launch Program, the DoD Space Test Program, and the Research and Development Space and Missile Operations program.

3.3.5 Space Development Group

(2008).Kirtland Air Force Base/ Directory – Units. Retrieved March 10, 2008, from http://www.united-publishers.com/kirtland/units2.html

Provides spaceflight for DoD Space Test Program, research and development payloads, experiments, risk-reduction demonstrations, and operationally responsive space systems. Builds, tests, integrates, launches, and operates research and development and operationally responsive space systems. Integrates, launches, and operates all DoD payloads on Space Shuttle and International Space Station. Provides development support to other Space Development and Test Wing programs. DoD lead for auxiliary payloads on Air Force expendable launch vehicles. Demonstrate technology for future space warfighting systems.

3.3.6 Space Test Group

(2008).Kirtland Air Force Base/ Directory – Units. Retrieved March 10, 2008, from http://www.united-publishers.com/kirtland/units2.html

Provides the expertise, infrastructure, and processes necessary to accomplish developmental test and evaluation of space assets, to include scientific, technology demonstration, and developmental systems, while enabling rapid migration of space capabilities to the warfighter. Accelerates mission design and integration, launch operations, and ground system development to provide reliable, low-cost access to space.

The Space Test Group provides unique, world-class capabilities to integrate, launch, and test space systems. It supports three types of space-based missions: one-of-a-kind, research and development, and responsive. Our support includes cradle-to-grave program execution from mission design to launch, early orbit, and on-orbit operations.

3.3.7 Defense Threat Reduction Agency (Albuquerque Office)

(2008). Defense Threat Reduction Agency. Retrieved March 10, 2008, from http://www.dtra.mil/

The primary mission of the Defense Threat Reduction Agency is to reduce the threat to the United States and the world from weapons of mass destruction (that is, nuclear, biological, radiological, and chemical weapons). In addition to the functions it serves at home, the DTRA is also responsible for reducing the threat of conventional war, especially in Europe, by participating in various arms control treaties to which the United States is a party, such as the Conventional Forces in Europe treaty and the Treaty on Open Skies.

3.3.8 Nuclear Weapons Center

(2008). Air Force Nuclear Weapons Center – United States Air Force. Retrieved February 4, 2008, from http://www.nwc.kirtland.af.mil/

The Nuclear Weapons Center (NWC) is located on the east side of Kirtland Air Force Base, New Mexico. NWC reports directly to the Air Force Materiel Command at Wright-Patterson AFB, Ohio.

Goals:

- Maintain nuclear weapons system security through timely and credible processes
- Enable the development and implementation of nuclear technology to maintain air, space and information dominance
- Sustain war-winning nuclear capabilities to ensure operational readiness and effectiveness
- Provide the work force with career development and progression opportunities
- Maintain and provide a quality work facility/environment
- Sustain a healthy, fit, safe, and ready work force

NWC Vision:

To be the Air Force's Center of Excellence for all nuclear weapon systems activities.

3.4 HOLLOMAN AIR FORCE BASE

http://www.holloman.af.mil/

3.5 CANNON AIR FORCE BASE

http://www.globalsecurity.org/military/facility/cannon.htm

3.6 FORT BLISS ARMY BASE

Fort Bliss is comparable in size to the state of Rhode Island.

https://www.bliss.army.mil/New/AboutFortBliss.htm

(No overarching info about their strengths)

http://www.globalsecurity.org/military/facility/fort-bliss.htm

3.7 WHITE SANDS LABORATORIES AND FACILITIES

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/testing/lab_fac/lab_fac.html

White Sand Missile Range (WSMR) is responsible for the test and evaluation of Army programs at the Range. While WSMR uses the large test areas and instrumentation for high profile tests, such as missile firings, the Range also contains a number of laboratory capabilities for supplementing these tests:

3.7.1 Aerial Cable Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/nr/testing/lab_fac/aerialcabledrange.html

WMSR's Aerial Cable Range is located in the north central area of the range. The three-mile long cable is suspended between two mountain peaks and is the longest unsupported cable span in the world. The cable, which can support up to 20,000 lbs, serves as a path for captive vehicles.

The Aerial Cable Facility can be used to provide cost effective testing on bombs, sensors, missiles, submunitions, prototype aircraft electronics, target and clutter characterizations, and electronic countermeasures and warning devices.

These vehicles can be accelerated by gravity or rocket at controlled speeds of up to 150 knots for gravity accelerated items and up to 250 knots for the rocket-assisted items. Elevations can be varied from 100 to 1,000 feet above ground level.

3.7.2 Analytical Chemistry Laboratory

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/chemicalanalysis.html

The Analytical Chemistry Laboratory is an all-purpose testing facility with a varied menu of services for our Army, Navy, and Air Force customers. The scope of work in this laboratory includes the following:

Conformance testing of material such as POL items, breathing air, missile and rocket propellants; explosives analysis of bulk material and breakdown products; failure analysis of mal-performing systems that have a potential chemical cause; toxic gas testing for incursion of missile and rocket exhaust by-products into crew cab breathing zones (man-rating); special chemical problems for which no standard testing protocol exists. The laboratory utilizes modern analytical instrumentation to answer chemical questions in a centralized lab setting and also uses portable equipment for data gathering in the field.

3.7.3 Certified Chemistry Laboratory

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/testing/lab_fac/CertifiedChemistryLaboratory.html

The Certified Chemistry Laboratory (CCL) is a modern, state-of-the-art facility that is dedicated to the analysis of hazardous wastes, waste water, and soil in accordance with Environmental Protection Agency procedures. The CCL has a full range of extraction and analytical equipment to perform SW 1311 Toxicity Characteristics Leaching Procedure (TCLP) and analysis for volatiles (SW 8260), semi-volatiles (SW 8270), and metals (SW 6010).The CCL also measures corrosivity (SW 9040, 9045) and ignitability (SW 1010). In addition, we also have the capability to perform SW 8330 for explosive residues and PCBs in transformer oil (SW 8082). The CCL maintains and utilizes a strong Quality Assurance/Quality Control plan and we provide an auditable data/QA package to customers. Typical turn-around time is 10 working days, but faster turn-around time can be negotiated.

3.7.4 Climatic Test Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climatic.html

WSMR has the capability to perform a wide variety of Climatic Tests.

WSMR maintains climatic environmental test chambers capable of high and low temperature, temperature shock, solar radiation, low pressure (high altitude), salt fog, rain (rain with wind), snow loading, icing/freezing rain, sand and dust, humidity, fungus, and leakage testing are immediately available.

A digital data acquisition system is used to acquire and process data. The system has the capability of acquiring data ranging from -100 degrees F to + 300 degrees F with an accuracy of +/- 1 degree for up to 150 channels. In addition, up to twenty transducers data channels (pressure, radiation intensity, etc.) can be acquired with an accuracy of +/- 0.2 percent.

3.7.4.1 Data Acquisition

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/datacq.html

All climatic test facilities are fully equipped with data acquisition, monitoring, and control systems. A digital data acquisition system is used to acquire and process data. The system has a capability of acquiring temperature data ranging from -100°F to +300°F with an accuracy of ±1°. In addition, transducer (pressure, radiation intensity, etc.) data can be acquired with an accuracy of ±0.2 percent.

3.7.4.2 Dusting Chamber Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/dustfac.html

The Applied Environments Test Branch at WSMR can now perform MIL-STD-810F, Method 510.4, Dust Testing of hazardous materiel at its new dust test facility located 1.5 miles from the main post area. The new facility houses an American Research Dust Chamber that has a test volume of 4' H x 4' W x 4' D. The chamber air temperature and relative humidity are controllable between 60-160°F and 5-30% RH. Dust concentrations up to 10.6 g/m^3 ±7 g/m^3 can be provided at air velocities ranging from 5-29 m/s. An on-site data acquisition system is available to record temperature, humidity, velocity, and dust concentration parameters throughout the test period.

3.7.4.3 Environmental Test Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/envtstfac.html

These facilities include the Hot Chamber, Altitude Chamber, and several other smaller climatic test chambers.

Facilities also include a Large Microbiological Chamber for fungus testing, the Field Rain and Wind Pad, the Field Sand and Dust Area, and High and Low Temperature Test Chambers that can be utilized for temperature shock tests.

The Hot Chamber (70' l x 24' w x 22' h) can perform high temperature, solar radiation, humidity, salt fog, rain, and rain with wind testing.

3.7.4.4 High/Low Temperature

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/highlow.html

Temperature environments ranging from -80°F to +200°F can be produced at our fixed facilities and portable chambers. Fixed temperature chambers are located at or nearby the main post and at several launch sites on the range to provide missile pre-fire temperature conditioning. With portable chambers, mobile power generators, and mechanical field conditioning units, temperature conditioning can be accomplished at any location, with or without firm power. In addition, fixed and mobile liquid nitrogen equipment exists to support tests that require extreme cold temperatures or rapid temperature changes. Hazardous (explosive) test items can be tested at many of the climatic test facilities. Portable chambers allow for testing to occur outside of WSMR if required.

3.7.4.5 Humidity

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/humid.html

Humidity testing is performed in accordance with MIL-STD-810. Humidity testing on large non-hazardous test items can be performed at the Bldg. 1544 multipurpose chamber. Hazardous test items can be tested at the salt fog/humidity chamber at Temperature Test Facility (TTF).

3.7.4.6 Ice and Freezing Rain

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/icing.html

Icing/freezing rain testing is performed in accordance with MIL-STD-810. Tests can be performed in the large and small test chambers at Temperature Test Facility (TTF), in the Vista walk-in chambers, and in other low temperature chambers/shrouds.

3.7.4.7 Leakage (Immersion) Test Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/leakimmtstfac.html

Leakage tests are performed in accordance with MIL-STD-810. The tests can be performed at various locations with a transportable tank. The tank can handle test items at a maximum size of four foot cubed and an immersion depth of one meter.

3.7.4.8 Low Pressure

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/lowpress.html

Altitude test equipment includes a small multipurpose altitude chamber, a small vibration altitude test chamber, and the large vacuum chamber (LVC) at the High Energy Laser System Test Facility (HELSTF). The small multipurpose altitude chamber can generate altitude environments from 500

feet below sea level to 80,000 feet above sea level. The small vibration altitude test chamber is used to simultaneously subject small test items to vibration and altitude environments to 40,000 feet. The LVC can simulate altitude environments up to 600,000 feet (10 E-6 torr), but has no temperature control. The maximum test article size is 15' diameter by 30' long, with a maximum test article weight of 25 tons.

3.7.4.9 Mobile Climatic Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/mobclifac.html

WSMR has large portable conditioning shrouds, several Mechanical Field Conditioning Units, two 350 KW generators available for temperature conditioning anywhere on White Sands or other DoD installations.

3.7.4.10 Rain

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/rain.html

Rain testing is performed in accordance with MIL-STD-810, with rain rates up to twenty-seven inches per hour produced in the Bldg. 1544 multi-purpose chamber (non-hazardous test items) and at the ETA-II rain pad (hazardous test items). Wind driven rain is generated utilizing three portable wind generators.

3.7.4.11 Salt-Fog

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/saltfog.html

Salt-fog testing is performed in accordance with MIL-STD-810. The tests are performed in the Bldg. 1544 multi-purpose chamber (non-hazardous test items), at the salt fog/humidity chamber (hazardous test items) at Temperature Test Facility (TTF), and in some portable units.

3.7.4.12 Sand and Dust

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/sanddust.html

The dust chamber, located in a non-hazardous testing area, can circulate silica powder through an 8' L x 8' H x 8' W test volume. The air velocity can be controlled up to 45 mph. The temperature of the circulating air can be controlled from 70°F to 170°F. Non-conditioned field sand tests can be performed on hazardous test items at ETA-II using up to three portable wind generators.

3.7.4.13 Snow

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/snow.html

A commercial snowmaking machine has recently been acquired and is available for performing snow-loading tests, or other customer requested tests.

3.7.4.14 Solar Radiation

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/solar.html

WSMR has the capability to perform the MIL-STD-810 solar radiation (heating effects) test, solar intensities up to 370 BTU per square foot per hour (1120 Watts per square meter) are supplied by suspended lamp banks. Three quartz lamp banks, each approximately 15' wide by 17' long, can be suspended end to end in the Temperature Test Facility (TTF) large test chamber or singularly in the TTF small test chamber or in the Bldg. 1544 hot chamber. In addition, a smaller quartz lamp bank (7' wide by 15' long) can be utilized in smaller chambers.

3.7.4.15 Temperature Shock

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/tempshotst.html

Chambers are available to perform temperature shock tests as specified in MIL-STD-810. Test items having a mass of 10,000 lbs. have been temperature shock tested and larger test items can be accommodated. Test item transfer can occur in less than five minutes between different test environments.

3.7.4.16 Temperature Test Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/climat/temptstfac.html

This facility is located two miles from the main post area and is approved for the testing of hazardous (explosive) test items up to 30,000 lbs.

It is the largest explosive licensed temperature test facility within the DoD.

Its three chambers are multipurpose. The Large (105' l x 40' w x 50' h) and Small (35' l x 30' w x 20' h) Test Chambers can perform high/low temperature and freezing rain testing.

The Large Test Chamber has been used to conduct environmental tests of complete weapon systems, to include operator functional tests of the system at temperature.

The Salt Fog/Humidity Chamber (20 x 15 x 10 ft.), as its name implies, can perform salt fog, humidity, and high temperature testing.

A snowmaking machine is available to conduct snow-loading tests.

Test item transfer can occur in less than five minutes between different test environments.

3.7.5 Dynamic Testing and Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntest.html

WSMR personnel assess and evaluate warheads and explosive devices to determine their lethality, reliability, vulnerability, and hazards associated with handling and transportation.

Tests include drop tests (up to 40 lbs); detonation propagation tests; slow cook-off tests; fast cook-off tests using JP-4, diesel, or wood; insensitive munitions tests; and bullet impact tests.

Centrifuge tests are conducted on safe and armed devices to measure arming devices and electrical parameters. Centrifuge tests emulate acceleration forces encountered during test flights.

Special Warhead Arena Tests are performed for pattern distribution, density, velocity, blast overpressure, and fragment size and weight. Inspection and failure analysis of damaged or questionable rounds are accomplished by remote explosive disassembly, including cutting, coring, and steaming. Technical consultation for customized explosive testing is also available.

The Dynamic Test Facility is approved for hazardous testing and consists of electrodynamics and electro-hydraulics test areas. The electrodynamics area includes three bays. One bay has four 18,000 lbf exciters that can be configured in push-push or push-pull arrangements. Up to eight exciters can be controlled simultaneously with the Multi-Axis Vibration Control System. A second bay contains the 3-D Exciter System. This system is capable of motion in three axes simultaneously with an output of 1,000 lbf or it can be used as an 18,000 lbf single-axis system. The third bay is dedicated to shock testing with 60" x 60" and 12" x 12" machines. Loose cargo testing is performed on a 6,000 lb. capacity Package Tester.

The Electro-Hydraulics building contains three 4" and four 10" actuators capable of 40,000 lbf (dynamic) and 70,000 lbf (static). This system currently is under development and is designed to test entire vehicles by providing six degrees of motion.

Launch sites are strategically placed both on and off WSMR to provide flight distances ranging from approximately 7 km to 300 km. The Warhead Impact Targets (WITs) are specifically designed and instrumented to support smart munitions/smart sub munitions (SM/SSM) programs in addition to a large variety of multiple cargo submunitions programs. WITs are circular, vary in size from 4,200 ft to 10,000 ft in diameter, and are grouped in two distinct categories. One category is used exclusively for tactical munitions configuration, and the other category is used exclusively for munitions that might contain live detonators in fuzing system but not contain an inert main charge.

WSMR operates 11 Warhead Impact Targets (WITs) used for air-to-surface or surface-to-surface test missions.

3.7.5.1 300K Dynamic Test Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/300dynamictest.htm

300K Dynamic Test Facility is located two miles from the main post area and is approved for the testing of hazardous (explosive) items. It consists of two electrodynamic shaker buildings, a static fire bay, a pendulum impact test area, and a centrifuge.

Each electrodynamic shaker building contains two 18,000 lb. exciters arranged side-by-side so that long items can be tested. The exciters have a two-inch displacement capability.

3.7.5.2 Acceleration

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/acctst.html

WSMR maintains a 108-inch radius arm centrifuge available for constant acceleration testing. The centrifuge can subject a test item weighing up to 300 pounds to a force of 100 G's. Accelerations of up to 200 G's can be achieved for small packages.

3.7.5.3 Conflagration

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/conflagrationtesting.html

WSMR has the capability to conduct slow cook-off and fast cook-off testing on rocket motors, missiles, warheads, and other explosive devices. Areas exist at the Hazardous Test Area and in the Warhead Impact Target (WIT) Areas.

Items containing multi-cargo warheads are restricted to the WIT areas, whereas items containing unitary warheads can be tested at the HTA.

A full range of instrumentation is provided to include temperature and over-pressure. Standard and high-speed video also are available. Tests are conducted in accordance with MIL-STD-2105.

3.7.5.4 Data Acquisition/Processing

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/datacq.html

Digital and analog recording data acquisition systems are available. Digital data sample rates of up to 50,000 samples/second can be achieved. Over 150 analog recording channels are available with a dynamic range of 40 dB over a frequency range of DC to 20K Hz.

3.7.5.5 ElectroDynamic Vibration Testing

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/elevibtst.html

Electrodynamic vibration exciters are available for Vibration Testing requirements. Large reaction masses accommodate multiple exciters for tests involving large forces, massive test items, or multiple degrees-of-freedom excitation.

A wide range of test setups can be accommodated such as three dimensional testing or large structure testing using multiple shakers. Most vibration test specifications can be accommodated with our Spectral Dynamics 2550-B vibration control systems.

Three Dimensional (3D) Electrodynamic Vibration System - The three dimensional vibration system simultaneously produces vibration in three directions. The system is capable of testing a 100-pound item to 10 G's peak with a frequency bandwidth of 5 to 500 Hz. The test item table size is 3' x 3' feet.

3.7.5.6 Finite Element Analysis and Model Test Services

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/fineleanamodtesser.html

Finite element models are developed for complex vibration fixtures to determine the dynamic properties of structures. Finite Element Analysis is performed using SDRC IDEAS software for linear static and dynamic analyses. Extensive model testing and analysis services are available to determine a structure's natural frequencies or resonance. Model services include estimating the life span and validating finite element models structures. Data acquisition equipment is portable and deployable at remote sites.

3.7.5.7 Impact

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/Impacttesting.html

A pendulum impact shock machine with a sixteen-foot cable length and a 10x16 foot mounting platform is available for performing packaged container transportation shock tests in accordance with Federal Standard 101. Rail impact tests are conducted in accordance with MIL-STD-810 utilizing facilities at Fort Bliss, Texas.

3.7.5.8 Launch Complex 33 (LC-33) Dynamic Test Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/laucom33dtf.html

LC-33 is located six miles from the main post area and is approved to test hazardous (explosive) items. It consists of an electrodynamic shaker building, an electrohydraulic shaker building, and a control building.

The electrodynamics building has three separate test bays.

The first bay contains the 3-D Vibration Exciter System capable of simultaneously generating three axes of vibration with an output of 1,000 lbf or can be utilized as an 18,000 lbf single axis system.

The second bay is the most versatile of our dynamic test areas. Four 18,000 lbf exciters can be configured to operate in a push-push or push-pull arrangement. This gives us the capability to vibrate large test items.

The ability to control multiple exciters (up to eight at one time) is possible with our Multi-Axis Vibration Control system located in the Control Building.

The last test bay is dedicated to shock testing with large (60" x 60" and 12" x 12") shock machines.

Currently under development is the 6-D Large Force Displacement System. This system is designed to test entire vehicles by providing motion along six axes. The system will be capable of 40,000 lbf (dynamic) and 70,000 lbf (static).

Temperature Altitude testing of explosive items is available at this location. Chamber size is 6' x 6' x 6'.

3.7.5.9 Load Testing and Center of Gravity

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/loatstcengratst.html

A variety of load cells and weight scales are available for performing load tests (dynamic or static) and center of gravity tests (5-100,000 lbs).

3.7.5.10 Loose Cargo

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/loocartst.html

Two loose cargo (packaged bounce) test machines are available. The loose cargo machines meet the requirements of MIL-STD-810 and ITOP 4-2-602. The maximum test specimen weight is limited to 6,000 pounds.

3.7.5.11 Rocket Motor Static Fire

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/rocmotstafirtst.html

WSMR maintains two thrust stands in the Hazardous Test Area (HTA) that are used to conduct static fire testing of rocket motors. One consists of 6-inch-thick armor plates assembled and reinforced with an earthen berm to form a base plate to restrain test items during testing. The second thrust stand consists of a reinforced concrete pad approximately 10 feet wide by 30 feet long by 2 feet deep. Tie points have been set in the concrete to restrain test items during testing. These sites are also used to conduct conflagration, bullet impact, and cook-off tests.

3.7.5.12 Shock Tests

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/dyntesting/shotst.html

WSMR maintains an extensive array of equipment is available for shock testing. All shock tests can be remotely controlled to accommodate explosive and hazardous test items.

Shock Testing Using Electrodynamic Exciters – Electrodynamic exciters can be used to produce classical pulses (half-sine, saw-tooth, trapezoidal) and complex pulses using shock synthesis techniques. Repetitive transient and wide-band random with mixed shock pulses (transient) can also be produced.

Shock Machines – Shock tests that require classical high peak accelerations or large velocity changes can be accommodated on shock test machines. All shock test machines can be configured to provide half-sine, terminal peak saw-tooth, or square wave shock pulses.

3.7.6 Survivability, Vulnerabilty Assessment Directorate (SVAD) Electromagnetic Testing Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/eleope.html

The SVAD operates extensive Electromagnetic (EM) Environmental Effects (E3) Test facilities to support the requirements for test and evaluation of weapons systems while being subjected to electromagnetic environments.

WSMR's growing, diverse customer base now includes multi-national companies from the private sector, leading research and development universities, Department of Defense (DoD) and other U.S. Government agencies, and various friendly, foreign governments. The critical core of WSMR is a seasoned staff of scientists, engineers, technicians, and other professionals whose consummate skills in comprehensive survivability and vulnerability simulation, test, evaluation, and assessment are coupled with their dedication to providing complete, quality customer support.

Specific areas of expertise include nuclear and EW/EO/EM effects simulation, test, evaluation, and assessment; life cycle survivability assessment; transient radiation effects on electronics (TREE) testing; and test technology, instrumentation, and maintenance of a comprehensive survivability database. The EW/EO/EM test facilities include the Electromagnetic Pulse and Electromagnetic Radiation facilities at WSMR, the Pulsed Laser Vulnerability Test System (PLVTS) at WSMR's High Energy Laser Systems Test Facility (HELSTF) site, and the Lightning Test Facility (LTF), also at WSMR.

These facilities, coupled with the equally impressive technical and engineering capability of the WSMR professional staff, provide the basis for the Directorate's established competency in EW/EO/EM effects simulation, testing evaluation, and assessment.

3.7.6.1 Electromagnetic Compatibility (EMC) Capability

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/ElectromagneticCompatibility.html

The increasing complexity of weapon systems has lead to system comprised of multiple electronic, electric, or electromechanical subsystems. Inherent in this situation is the possibility that the emissions of one subsystem will degrade the performance of another and thereby have a negative impact on the entire system as a whole. The purpose of EMC testing is to explore and document this phenomenon. All EMC testing conducted at WSMR is performed in accordance with MIL-STD-E-605D.

3.7.6.2 Electrostatic Discharge Facility (EDF)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/eleope/eledisfac.html

Electrostatic discharge (ESD), or static electricity, as it is commonly known, can be potentially devastating to sensitive electronics. To ensure that weapon systems are hardened against damage from ESD, WSMR has the capability to perform both personnel-level (25,000 volts direct current [VDC]) and helicopter-level (350,000 VDC) ESD testing. Both tests are performed in accordance with TOP 1-2511.

The personnel-level ESD simulator used at WSMR is hand portable, which allows for discharge at any point on a system under test. Helicopter-level tests are performed by placing the item under test on nonconductive blocks, attaching one pole of a DC power supply to the item, and bringing a ground wand near enough to the test item to discharge the electrical charge.

Both personnel-level and helicopter-level ESD testing is done on a go/no-go basis; i.e., a system passes if it remains operational and safe after exposure to the ESD; otherwise, the system fails.

These helicopter tests are critical because helicopters and the items they transport can build up large charges of static electricity, as high as 350,000 VDC, as they fly through dust storms, winds, and clouds. When the helicopter lands, this electricity can discharge and cause extensive damage.

3.7.6.3 Electromagnetic Radiation Hazards (EMRAD HAZ)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/EMRADHAZ.html

Hazards of Electromagnetic Radiation to Ordnance (HERO) testing is performed at the Electromangetic Radiation Effects (EMRE) facility. Hazards of Electromagnetic Radiation to Fuel (HERF) and Hazards of Electromagnetic Radiation to Personnel also are tests that can be performed.

3.7.6.4 Electromagnetic Interference Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/eleope/eleintfac.html

WSMR conducts EMI testing to precisely measure the EM emissions from a system and to subject the test item to external radio frequency (RF) signals to determine the item's susceptibilities to EMI. At either of two facilities, an entire battery of EMI testing can be performed, including radiated emissions, radiated susceptibilities, conducted emissions, and conducted susceptibilities, and in compliance with applicable military standards (MIL-STDs).

3.7.6.5 Electromagnetic Pulse (EMP) Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/ElectromagneticPulseFacility.html

The Horizontally Polarized Dipole (HPD-II) is a high-level-pulse, high-frequency, hybrid EMP simulator that combines features and qualities of radiating simulators with those of transmission line/bounded wave simulators. A half-toroidal antenna with a major radius of 10 m and a minor radius of 0.77 m, the HPD-II provides horizontally polarized DoD STD 2169A E-1 environments for weapons systems objects located on the earth's surface.

The HPD-II is stationed at WSMR, but is a mobile EMP simulator and routinely requested by the customer to be set up at remote sites. The mobile HPD-II consists of a lowboy trailer used to transport the pulsar, antenna, and a data acquisition/pulser control trailer with all required instrumentation.

3.7.6.6 Lightning Test Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/datts/testing/lab_fac/eleope/ligtstfac.html

Lightning strikes the earth, on average, more than 100 times each second. The typical lightning stroke is six miles long. The temperature of the return stroke, or primary flash, can reach 50,000°F, or nearly five times hotter than the surface of the sun. Property losses from lightning total in the

hundreds of millions of dollars each year in the commercial and private sectors alone. Losses to military facilities and equipment are equally high and can only be expected to rise as semiconductor devices, which are inherently more susceptible to lightning effects, are increasingly used in military equipment. To facilitate the study and mitigation of this devastatingly powerful natural phenomenon, WSMR has installed a Lightning Test Facility (LTF) to simulate the direct and indirect effects of lightning strikes.

Direct effects of lightning include burning, eroding, blasting, and structural deformation caused by lightning arc attachment, as well as by the high-pressure shock waves and magnetic forces produced by the associated high currents. Indirect lightning effects are predominantly those resulting from the interaction of the electromagnetic fields accompanying lightning with electrical devices.

Working with the LTF, WSMR engineers have developed a lightning effects test capability in accordance with MIL STD-1757A, which establishes standards for the waveforms used to determine direct and indirect effects of lightning strikes.

3.7.7 Electronic Warfare

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew.html

3.7.7.1 Air Defense Electronic Warfare Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/airdefelewarfac.html

This facility provides a quick-reaction capability for the implementation of electronic warfare (EW) techniques to ensure that all elements of the EW threat required for the vulnerability assessment process are addressed. The facility provides a wide range of R&D ECM devices that support air defense EW vulnerability investigations including PATRIOT, THAAD, Corps SAM, GBS, HAWK, MRSR, Stinger, and Chaparral. In addition, support has been provided to other activities including Javelin. The facility supports a wide variety of special-purpose equipment, including airborne and ground-based RF jammers, EOCM equipment, passive RFCM equipment, and state-of-the-art field measurement systems. The facility developed, operates, and maintains 112 airborne RF EW systems, 19 airborne EO devices, and a wide variety of ground-based EW emulators and target simulators.

3.7.7.2 Electronic Warfare Signature Measurement Facility

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/elewarsigmefac.html

This mobile facility contains specialized multi-spectral radiometric and imaging measurement systems to characterize static and dynamic targets and EW countermeasures in the backgrounds in which they operate. Results are used in EW simulations, signature modeling validation, and EW analysis. The facility includes laboratory-based data reduction and instrument calibration and checkout/characterization.

3.7.7.3 Electro-Optical Vulnerability Assessment Facility (EOVAF)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/eleoptvulassfac.html

The EOVAF consists of a number of laboratory measurement stations that enable quantitative optical cross section, laser jamming, and optical characterization measurements to be performed in the visible, near-IR, mid-IR, and far-IR spectral regions. A number of optical characterization measurements can be performed at the EOVAF including optical density, optical transfer function, minimum resolvable temperature difference, spectral transmission, and detector responsivity.

Adjacent to the EOVAF is a 3-km instrumented laser range. Mobile equipment is available to perform measurements of maximum optical detection range and laser jamming susceptibility. Trailer-size mobile targets (visible and thermal) are available to allow the quantitative evaluation of laser-induced degradation in a field environment. The targets also allow baseline optical characterization measurements to be performed on optical systems.

3.7.7.4 Electro-Optical Range and Tower

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/eleoptrantow.html

The electro-optical range and tower provide a field experiment complex for accurate simulation of operational scenarios in CM environments (EO and others). Ground vehicle and missile/munitions engagement geometries can be closely approximated for carefully controlled measurements and experiments that yield credible data for use in simulations and analysis. An approved process and SOP are in place for operating electro-optical devices within this complex.

3.7.7.5 Electro-Optical Data Acquisition and Tracking System (EDATS)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/eleoptdatacqtrasyst.html

The EDATS is a mobile facility used to explore electro-optical missile system responses to countermeasure environments using actual targets and countermeasures. EDATS provides a unique capability of dynamically tracking and measuring target signatures during EW missile firing experiments. EDATS consists of a 35 foot instrumentation van integrated with an automated tracking pedestal capable of controlling the operation of six electro-optical missile seekers in a captive track arrangement. Data collected from the captive seekers can be recorded for post-mission analysis. Video documentation of seeker responses to the EOCM environments aids quick-look analysis. EDATS is equipped with IR through ultraviolet spectrometers, radiometers, and imagers to obtain signatures of targets, countermeasures, and backgrounds.

3.7.7.6 Electro-Optical Countermeasures Flight Simulator

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/eleoptcoumisflisim.html

This facility is a hardware-in-the-loop, real-time simulator for assessing the effectiveness of EO air defense missile systems in complex countermeasure environments. The simulator consists of both analog and digital computer systems supplemented by special scene generation hardware and software capable of providing a complex EW environment consisting of decoy flares, EO-jammers, advanced countermeasures devices, and complex backgrounds. The simulator also includes major portions of actual missile guidance and control hardware with software embedded in the simulation loop. Real-time representations are solved for missile dynamics in six degrees of freedom and for target motion in three degrees of freedom. A multiprocessor digital computer solves the missile

aerodynamics and propulsion and the relative target-missile geometry. The analog computer models subsystems with bandwidths too high to allow a real-time digital solution, such as the wing servo or gyro transfer function. A second digital computer functions as the simulation controller and supervises the real-time trajectory and field-of-view displays hosted on two PCs.

This facility reduces cost of missile firing tests required to provide survivability and lethality data for inclusion in system analyses. Output data consists of miss distance, missile trajectory information, and missile system parameters. The simulation is validated against actual missile flights to ensure accuracy.

Additionally, this facility has access to a computer-controlled rate table and various EO devices to assist in characterizing seeker effects that are modeled in the simulator.

3.7.7.7 Field Mobile Measurement System (FMMS)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/fiemobmeasys.html

The FMMS is a computer-controlled special-purpose measurement system that supports EW vulnerability analyses by independently measuring, recording, and certifying EW environments. It can sequentially track up to 12 targets and measure frequency, amplitude, pulse widths, and modulation parameters of various jamming waveforms. The system is housed in a climate-controlled van mounted on a 5-ton truck chassis to provide the capability to relocate to remote sites.

The system also features automatic pre- and post-mission calibration to ensure the validity of recorded data. Ongoing upgrades will allow remote site operations, target tracking, and auto emplacement through the use of GPS.

3.7.7.8 Open-Loop Training Complex (OLTC)

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/opeloptracom.html

The OLTC was developed to explore electro-optical (EO) missile system responses to countermeasures environments using simulation scene techniques. The OLTC consists of an automated rate table with scene generation equipment that provides radiation from three broad band xenon arc lamps, target and decoy blackbodies, and an HF/DF chemical laser. Signal conditioning, signal recording, and data logging equipment augment data collection from this facility. Simulation studies to ascertain design weaknesses of an EO missile system design are conducted using an actual missile seeker or a breadboard electronic model of the seeker.

3.7.7.9 Test Environment Certification Process

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/ew/tstenvcercom.html

The TECC is a computer controlled receiving and analysis facility that monitors and analyzes complex electronic countermeasure waveforms used in field experiments associated with air defense systems. The TECC consists of a narrow-beam steerable antenna system, multiple RF receivers, and various hardware and software analysis systems.

Airborne targets with electronic countermeasures are tracked and measurements of power, frequency, and modulation are made in real-time to serve as the basis for certifying the countermeasures environment during the experiment.

3.7.8 Information Operations Laboratory

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/bd/testing/lab_fac/IO.html

The IO Lab is designed to support Army Research Laboratories (ARL's) Survivability/Lethality Analysis Directorate (SLAD) in its vulnerability/survivability assessments of Information Technology (IT) components in US Army item level and weapon systems platforms. The IO Lab consists of computers and software that are part of the Army Common Hardware Software 2 (CHS-2) program, many of which are part of the First Digitized Division. Several different configurations of computers, from low-end Intel processors to high-end Sun Micro System multi-processor computers, can be configured to emulate the configuration of fielded systems. Laboratory investigations are conducted on systems to identify IO susceptibilities and/or vulnerabilities. These vulnerability investigations can be destructive from a software perspective. Hence, the IO Lab is an ideal place to install operating systems and application software that mimic a fielded system. Much of the IO Lab capability is portable in order to support field investigations.

The IO Lab also can be configured to support several different network topologies and configurations with Cisco Systems (a brand name) routers, switches, and hubs. The ability to reconfigure the network allows for assessment of router and component vulnerability to outside network attacks. The network can be split into different network segments depending on the investigation. One of the network segments can launch attacks while another can be used to monitor network traffic and assess network intrusion detection software, while the platform systems are on a different network.

3.7.9 Launch Facilities

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/Launchfacilities.html

White Sands Test Center operates over fifty unique launch facilities supporting surface-to-air and surface-to-ground weapon testing. The major launch facilities are described in the following paragraphs.

3.7.9.1 Launch Complex 33

Launch Complex 33 (LC-33) was the first launch site constructed on the Range. This is the site of the V-2 rocket testing, which began in 1945. The Multiple Launch Rocket System (MLRS) uses LC-33 and other sites to perform live firings tests.

3.7.9.2 Launch Complex 34

Launch Complex 34 (LC-34) was established as the land-based test site for the Navy's Rolling Airframe Missile (RAM) program. This is a semi-hardened site used to flight test RAM against subscale and subsonic targets. The site is used to test various configurations of RAM missiles, weapon systems, support systems, and launchers.

3.7.9.3 Launch Complex 35 West

Launch Complex 35 West (LC-35W), known as the Desert Ship LLS-1, is primarily used for live fire testing the Navy's STANDARD Missile (SM). The Navy currently is testing the Standard Missile and Evolved Sea Sparrow Missile (ESSM) at this site.

All versions of STANDARD Missile have been tested at the Desert Ship including SM-2 Block II (Terrier, Tartar, AEGIS, and Vertical Launch AEGIS), SM-2 Block III, IIIA, IIIB, and SM-2 Block IV (Extended Range Vertical launch AEGIS). Other Navy systems tested here include Sea Lance, NATO Sea Sparrow Missile, and Vertical Launch ASROC (VLA). The Desert Ship functionally duplicates the fire control requirements of a surface ship with dedicated telemetry, target monitoring, and data extraction and reduction systems. An MK-39 5-inch/54 Gun Mount is also located here.

3.7.9.4 Launch Complex 35 East

Launch Complex 35 East (LC-35E) is a Research Rocket facility that includes a blockhouse, launch control equipment, and a payload assembly building. Current use of this facility is for NASA's payload buildup and uplink control of rocket payloads.

3.7.9.5 Launch Complex 36

Launch Complex 36 (LC-36) is used for launching suborbital rockets. The complex includes a blockhouse, launch control equipment, and four active launchers with environmental shelters. These launchers are:37-foot rail with 8,000 lb capacity, 48-foot rail with 25,000 lb capacity, 160-foot rail (tower) with 8,000 lb capacity, 48-inch diameter stool with 50,000 lb capacity, 30-foot rail with 15,000 lb capacity that can support off-range operations.

3.7.9.6 Launch Complex 37

Launch Complex 37 (LC-37) is the Advanced Gun Munitions Test Site and includes a concrete structure for housing various advanced gun systems, a permanent bunker and a concrete pad. LC-37 had been designated as the facility to test the new Theater Missile Defense interceptors, such as the Theater High Altitude Area Defense (THAAD) missile that made its first flight on the Range in April 1995.

3.7.9.7 Launch Complex 38

Launch Complex 38 (LC-38) is the site for all Patriot air defense missile testing, starting in the early 1970s, when it was known as SAM-D. All versions of the Patriot missile, to include PAC-3, have been tested and will continue to test in the foreseeable future.

3.7.9.8 Sulf Site Launch Facility

This complex is located at the northwest end of the Range and is equipped with a blockhouse and ordnance assembly building, three active launchers, and a 65-foot environmental shelter. This complex is used to launch targets to support missile intercept testing and to launch technology demonstrations or unique science and engineering payloads into sub-orbital trajectories.

3.7.9.9 West Center 50 (WC-50)

This center is located in the central portion of the Range near Rhodes Canyon. This facility includes a hardened blockhouse and maximizes the ability to accommodate testing of short-range systems without a Flight Termination System.

3.7.10 Metallurgy Laboratory

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/metal.html

The Metallurgy lab functions as a support laboratory for the various services offered by WSMR, providing non-destructive testing, failure analyses, materials evaluation and development, and mechanical testing.

The lab is equipped with a full compliment of sample preparation equipment for the microstructural analysis of ferrous and non-ferrous alloys. The Metallurgy lab has a fully equipped optical microscopy room ranging from low power stereomicroscopy to scanning electron microscopy of magnifications up to 30,000X. The scanning electron microscope is equipped with digital imaging and energy dispersive x-ray analysis software.

3.7.11 Warhead Testing

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/warst.html

WSMR assesses and evaluates warheads and explosive devices, determining the hazards associated with the handling and transportation of the explosive material.

Ground safety tests involve a variety of experiments. Drop Tests (up to 70 ft.), including live multi-cargo warheads and rocket motors, are routinely performed. Detonation Propagation Tests of small to large explosive items are available. Slow Cook-Off Tests are conducted, as well as Fast Cook-Off Tests using JP-4, diesel, or wood.

Additional ground safety tests include Insensitive Munitions Tests and Bullet Impact Tests.

Special tests also are performed, including Warhead Arena tests for pattern distribution, density, velocity, blast overpressure, and fragment size and weight.

Centrifuge Tests of Safe and Arm devices are executed to measure arm times and electrical parameters. Inspection and Failure Analysis of damaged or questionable rounds are accomplished by remote explosive disassembly, including cutting, coring, and steaming. Technical consultation for customized explosive testing is also available. WSMR has a number of Warhead Impact Target (WIT) areas designed for debris capture and analysis

3.7.11.1 Warhead Impact Target

(2008). White Sands Missile Range. Retrieved March 4, 2008, from http://www.wsmr.army.mil/capabilities/st/testing/lab_fac/warimptarare.html

Areas for projected missile impacts have been strategically located throughout WSMR. These impact areas are specifically designed and instrumented to support smart munition/smart submunition (SM/SSM) programs in addition to a large variety of multiple cargo submunition programs.

Launch sites are strategically placed on and off WSMR to provide flight distances ranging from approximately 7 km to 300 km.

The impact areas are operationally controlled and maintained by WSMR. The impact areas can be used for air-to-surface or surface-to-surface test missions in which the launch points are within or outside of WSMR. The impact areas are essentially circular, ranging in size from 4,200 to 10,000 feet in diameter and are grouped into two distinct categories: Phase I and Phase II.

Phase I impact areas are used exclusively to test submunitions that have live detonators in the fusing system, but contain an inert main charge, telemetry-type-submunitions, totally inert submunitions with no detonators in the fusing system, or mass model type submunitions. The submunitions tested in these impact areas are non-lethal; recovery and analysis are allowed. These areas are maintained in a mowed grassland condition.

Phase II impact areas are designated as Warhead Impact Target (WIT) areas and are specifically designed for testing tactical configuration submunitions in which the fusing system will detonate the lethal mechanism as intended in the productive configuration design. The submunitions tested in these impact areas are lethal (live). Recovery or any type of handling normally is not allowed, with dud munitions being exploded in place. These areas are maintained in a bare ground (bladed) condition.

The Phase II impact areas also are used to conduct insensitive munition testing in accordance with MIL-STD-2105 on special items, warheads with multi-cargo lethal payloads, smart munitions, or munitions that have a total explosive weight that exceeds the allowable limits at the Hazardous Test Area.

The impact areas are grouped to ensure the safety of personnel who must enter the impact areas to collect data and to enhance the diagnostic effort utilized to analyze the functional aspects of submunitions. There are seven Phase I and four Phase II impact areas on WSMR.

3.8 SANDIA NATIONAL LABORATORIES

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/

Sandia National Laboratories has been developing technologies to support the complex problems facing the nation in the realm of national security since 1949. The entire nation depends on Sandia's exceptional abilities to thwart national and global threats to ensure Americans with peace and freedom.

Sandia fulfills research and development role through six key areas related to its mission of national security including the following:

- Nuclear Weapons: ensuring the stockpile is safe, secure, reliable, and can support the United States' deterrence policy
- Energy and Infrastructure Assurance: enhancing the surety of energy and other critical infrastructures
- Nonproliferation: reducing the proliferation of weapons of mass destruction, the threat of nuclear accidents, and the potential for damage to the environment
- Defense Systems and Assessments: addressing new threats to national security
- Homeland Security: helping to protect our nation against terrorism
- Science, Technology, and Engineering: conduct R&D programs to support all national security missions

Sandia is a government-owned/contractor operated (GOCO) facility. Sandia Corporation, a Lockheed Martin company, manages Sandia for the U.S. Department of Energy's National Nuclear Security Administration. Sandia seeks collaborative partnerships on emerging technologies that support its mission.

Facilities available to the public:

3.8.1 Advanced Battery Research Engineering and Evaluation Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/battery.html

This facility provides comprehensive capabilities in power source research, engineering, characterization, evaluation, and testing. Supporting ABREE is a staff of over forty scientists, engineers, and technicians with backgrounds in chemistry, electrochemistry, metallurgy, chemical engineering, materials science, engineering, and physics.

Cutting-edge equipment and software are available to perform research activities for any relevant primary or rechargeable technology. In addition to its numerous wet chemical laboratories, several battery test laboratories, and computer database management equipment, the facility provides two dry rooms containing the equipment to fabricate and assemble finished thermal batteries and lithium ambient-temperature batteries from raw materials.

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3.8.2 Center for Security Systems

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/nusec.html

The Center for Security Systems fully integrates research, development, and applications that provide systems and technologies to find weaknesses in national security and seek to understand and solve those threats before they can be exploited.

In implementing this vision, the Center routinely partners with corporations to test for all aspects of physical security, and develops many new technologies, including sensors, video, image processing, alarm communications and display, entry control, contraband detection, insider protection, barriers, activated delay, robotics, and modeling and simulation.

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3.8.3 Combustion Research Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/combustion.html

The Combustion Research Facility is a world-renowned Department of Energy user facility. The facility conducts a broad array of basic and applied research and development in combustion science and technology, with the purpose to improve the national ability to utilize and control combustion processes.

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3.8.4 Design, Evaluation, and Test Technology Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/design-eval.html

This facility provides simulations of a broad array of environments for component and system testing by drawing on the expertise of other facilities. These environment simulations range from normal in-use environments to extreme accident conditions. In addition, a wide variety of diagnostic equipment is available, such as nondestructive testing, photometric and optics, and electronic data acquisition. All these capacities are researched and maintained in order to support testing and research activities.

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3.8.5 Electronic Technologies User Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/microelectronics.html

The Electronic Technologies User Facility works with the U.S. microelectronics industry and universities to develop next-generation manufacturing equipment and processes. It provides a state-of-the-art fabrication environment for research in device and circuit design to meet manufacture-hardened technologies. It is the only industry-compatible microelectronics fabrication facility within the Department of Energy. Its ability to support a broad spectrum of microelectronics projects makes it unique among U.S. integrated circuit facilities.

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3.8.6 Engineering Sciences Experimental Facilities (ESEF)

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from the Sandia Web site http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/eng-sci.html

The Engineering Sciences Center conducts basic research and development in thermodynamics, fluid mechanics, aerodynamics, solid mechanics and micromechanics. This center welcomes the needs of industry to solve their problems of interest, especially those technologies with applications to the Departments of Energy, Defense, and Homeland Security.

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3.8.7 Explosive Components Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/explosive.html

The Explosive Components Facility provides a full range of capabilities required to analyze energetic materials and to test their performance. The center utilizes an advanced design of energetic devices and subsystems

Contact
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Fax: (505) 844-5924
msgarre@sandia.gov

3.8.8 Geomechanics Laboratory

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/geomechanics.html

The Geomechanics Laboratory has practical applications to underground construction, mining, oil and gas production, reservoir management, hydrocarbon and compressed air storage, hazardous waste disposal, fluid flow and contaminant transport. In practice, the laboratory builds models of the governing deformation and fracture processes to make predictions of rock mass response. The Geomechanics Laboratory assists in the simulation of a wide variety of conditions, including high pressures and complex load paths.

Contact
Laurence S. Costin
Phone: (505) 844-3367
Fax: (505) 844-7354
lscosti@sandia.gov

3.8.9 Intelligent Systems and Robotics Center

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/systems-robotics.html

The Intelligent Systems and Robotics Center operates out of the Robotic Manufacturing Science and Engineering Laboratory. The purpose of the organization is to consolidate all of Sandia's robotics researchers in an environment conducive to developing practical applications to scientific breakthroughs.

The research and development have a wide variety of applications including electromechanical medical devices, inspection and assessment of physical infrastructure, landmine detection and removal, time and cost efficiency of hazardous waste cleanup, autonomous vehicle control, and aircraft maintenance and coatings.

Contact
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Fax: (505) 844-1766
rwshaum@sandia.gov

3.8.10 Ion Beam Materials Research Laboratory

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/beam-materials.html

The Ion Beam Analysis program is recognized as one of the best in the world. It has the ability to examine a wide spectrum of materials, from semiconductors to metals and ceramics. Several landmark accomplishments of the facility include the invention of several new ion beam analysis techniques for light and heavy elements and a unique enhanced nuclear microprobe-based single-event upset (SEU) imaging system.

The center allows qualified users to operate its store of equipment, which include 6 MV tandem Van de Graaff accelerators for high energies, Van de Graaff accelerator for RBS and channeling, Cockroft Walton accelerator for HIBS analysis, and RFQ booster for gold ions at 380 MeV.

Contact
Barney L. Doyle
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bldoyle@sandia.gov

3.8.11 Manufacturing Science and Technology

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/man-tech.html

The Manufacturing Science and Technology Center develops and applies specialized manufacturing processes to produce products to fulfill Sandia's primary mission to ensure the nation's nuclear weapons are safe, secure, and reliable.

These products are usually complex electro-mechanical or electronic parts designed to withstand harsh environments with high reliability.

The center collaborates with various sectors from Sandia National Laboratories as well as other federal agencies, industries, and universities in an effort to exceed customer expectations.

Contacts

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jmharri@sandia.gov

Carla D. Chirigos
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Fax: (505) 844-2977
cdchiri@sandia.gov

3.8.12 Materials and Process Diagnostics Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/advanced-mat.html

Sandia and the University of New Mexico collectively run the Materials and Process Diagnostics Facility, goal of which is to address the country's needs in materials synthesis, processing, and manufacturing. The 45,000-square-foot laboratory, located at the University Center Research Park, is equipped with the latest equipment for materials synthesis, processing, and characterization.

Contacts

Ronald E. Loehman
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Fax: (505) 272-7304
loehman@sandia.gov

Abhaya Datye
Phone: (505) 272-7601
Fax: (505) 272-7304
datye@unm.edu

3.8.13 National Solar Thermal Test Facility (NSTTF)

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/nsttf.html

This large facility conducts much of the country's cutting-edge research and development on solar thermal components. Furthermore, the facility can assist in the evaluation of many applied technologies for which intense thermal flux is required. The facility also is unparalleled in its equipment including a 200-foot tower with four test stations used to evaluate solar heat energies and thermal receivers, engine test laboratory, a windowed wind tunnel for nuclear flash simulation, computer controlled test platform that rotates to follow the sun's position, and large-scale optical systems that act as light collectors for astronomical research and other laser applications.

Contact
Jeffrey Nelson
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Fax: (505) 284-2529
jsnelso@sandia.gov

3.8.14 NUFAC Nuclear Facilities Resource Center

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/nufac.html

The Nuclear Facilities Resource Center (NUFAC) is an exceptional national resource in providing unique capabilities for researching, developing, and applying nuclear solutions to problems of global importance. The center's advancements in nuclear technology are derived from working with other facilities and experts from other fields from Sandia.

NUFAC supports a wide variety of programs including designing, operating, and experimentation with nuclear reactors. The Nuclear Facilities Resource Center performs core testing of reactor fuel, criticality experiments, radiation processing of semiconductor materials, testing of electronic piece parts and components, activation analyses, characterizing radioactive materials, and producing radioisotopes.

Contact
Kenneth Reil
Phone: (505) 845-3026
Fax: (505) 284-3651
korei@sandia.gov

3.8.15 Photovoltaic Laboratories

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/photovoltaic.html

The Photovoltaic Laboratories work closely with private industry in developing solar cells as well as other applications of converting light directly into energy. The laboratories strive to accomplish two valuable primary functions: encouraging the commercial use of photovoltaic energy systems and improving those systems' performance.

Contacts
David L. King
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Fax: (505) 844-6541
dlking@sandia.gov

Jerry W. Ginn
Phone: (505) 845-9117
Fax: (505) 844-2890
jwginn@sandia.govPlasma Materials Test Facility
(2008). Sandia National Laboratories. Retrieved February 4, 2008, from
http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/pmtf.html

The Plasma Materials Test Facility (PMTF) is operated for DOE by the Fusion Technology Department of Sandia National Laboratories. It contains a 1.2 MW, dual-source, CW electron beam system, the EB-1200, that is used for one-sided heating of test articles over areas as large as .7m x .4 m. The PMTF also has a 60 kW electron beam system for smaller targets, where targets can be connected to a closed-loop, 4 MPa, helium coolant system. Both electron beams share a high pressure, high temperature (7MPa, 280 °C) closed-loop water system for target cooling.

Sandia scientists and technical personnel at the PMTF can assist various customers by performing high-heat-flux testing and evaluation of fusion components, advanced heat exchangers, high-temperature materials, and advanced joining techniques. The staff also can provide modeling of plasma/material interactions, particle transport in physical vapor deposition plumes and assist in the development of new PVD process control techniques.

Contact
Dennis Youchison
Phone: (505) 845-3138
Fax: (505) 845-3130
dlyouch@sandia.gov

3.8.16 Primary Standards Laboratory

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from
http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/psl.html

The Primary Standards Laboratory develops and maintains primary standards that are traceable to national standards and calibrates and certifies customer reference standards. The laboratory also provides technical guidance, support, and consultation, and helps to develop precision measurement techniques and provide measurement uncertainty analysis.

Contact
Larry Azevedo
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Fax: (505) 844-4372
ljazeve@sandia.gov

3.8.17 Pulsed Power and Systems Validation Facility

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/pulsed-power.html

The Pulsed Power and System Validation User Facility offers access to unique equipment to support specialized research, along with the expertise to address complex problems dealing with radiation effects.

Contacts
Kenneth Mikkelson
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Rob Tachau
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Fax: (505) 845-7602
rdtacha@sandia.gov

3.8.18 Radiation Detector Analysis Laboratory

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/radiation.html

This facility provides assistance to users from federal laboratories, U.S. industry, and academia in the areas of testing and characterizing radiation detector materials and devices and determining the relationships between the physical properties of the detector materials and the device response. Systems of interest include scintillators and room-temperature semiconductors for detection arrays of x-rays, gamma rays, and neutrons.

Contact
Patrick Doty
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Fax: (925) 294-3410
fpdoty@sandia.gov

3.8.19 Sandia Orpheus Site

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/orpheus.html

The Orpheus facility is a test site and a mobile laboratory of the Geothermal Research Department used to design and evaluate methods for employing acoustic waves in deep wells. This includes both remote inspection of and communication with down-hole equipment. These are not audible waves that one normally associates with acoustic measurements, but rather stress waves that are trapped in the steel tubulars and that are relatively inaudible.

Contact
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Fax: (505) 844-3952
dsdrumh@sandia.gov

3.8.20 Shock Thermodynamic Applied Research Facility (STAR)

(2008). Sandia National Laboratories. Retrieved February 4, 2008, from http://www.sandia.gov/bus-ops/partnerships/tech-access/facilities/star.html

The STAR Facility is a state-of-the-art facility that can provide a full range of projectile/ target interactions. Impact velocities from 0.01 to 16km/s are available with a broad range of diagnostic and analysis capabilities. A diverse technical staff with many years of experience is available for consultations.

Contact
William D. Reinhart
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Fax: (505) 845-3412
wdreinh@sandia.gov

3.8.21 Small Business Services

Sandia National Laboratories is dedicated to strengthening the national and regional economy by providing contracting opportunities for small businesses. Sandia's commitment to small business and supplier diversity is reflected by seeking out innovative small business that can provide quality products and services on time and within budget. The Small Business Administration defines a small business a one that operates for a profit with less than 500 employees.

The Business Point of Contact is the first step in learning how to do business at Sandia National Laboratories, and is also the primary liaison between the business community and Sandia. Below are the following services you can expect to obtain through the Business Point of Contact:

- Provides overview on Sandia's key mission areas and what products and services are purchased to meet Sandia's programmatic needs.
- Explains Sandia's expectations of suppliers.
- Navigates interested suppliers through Sandia's Corporate, Procurement, and Forecasting Web sites.
- Educates suppliers on how to market to Sandia.

Contact
(800) 765-1678
supplier@sandia.gov

Small Business Service

- Advocates on behalf of Small Business.
- Guides the supplier through the procurement process.

- Identifies forecasted procurement opportunities where small businesses have potential to bid.
- Addresses supplier questions and concerns regarding current or future purchasing requirements.
- Participates in outreach and matchmaking events to identify highly qualified suppliers that have the capability and capacity to meet Sandia's diverse purchasing needs.

Forecasting Opportunities

- Provides a listing of potential contract opportunities for products and services at Sandia National Laboratories.
- Helps firms locate new markets for their products and services within Sandia early in the procurement process.
- If a firm determines that they are interested in obtaining a Request for Quotation on a specific forecast, the company is required to register in Sandia's iSupplier database.

3.9 NEW MEXICO STATE UNIVERSITY

Note: All New Mexico State University research labs may be found online at: http://research.nmsu.edu with a general overview at: http://research.nmsu.edu/NMSU_RESEARCH_OVERVIEW.pdf

3.9.1 Biosciences

Mission: Provide support for cross-disciplinary teaching, research, and industry development in complex biological systems and their applications to biotechnology.

Membership: 109 members, 25 units

Subclusters: Biodiversity; Infectious Diseases; Bioinformatics; Human Populations; Molecular Targets; Sustainable Agriculture; Science Preparation in Research, Instruction, and Training.

Research Centers (Associated College)**:** Plant and Animal Genomics and Molecular Biology Group (CAHE, COE, A&S); Biological Control and Integrated Pest Management Group (CAHE); 12 Agricultural Science Centers throughout the State (CAHE); NSF CREST Bioinformatics and Computational Biology Center (A&S).

3.9.2 Information Sciences and Security Systems

Mission: Significantly increase New Mexico's participation and job opportunities in the growth of information-related technologies with application to government and commercial sectors.

Membership: 120 Members, 30 units

Focus Areas: Human Use of Information Technology; Digital Media; Decision, Social, and Behavior Modeling; Geospatial Modeling; Artificial Environments; Robotics; Networked Environments.

Research Centers: Physical Science Laboratory (PSL); NSF CREST Bioinformatics and Computational Biology Center; Southwest Border Security Consortium; Remote Sensing and Sensor Development Group (COE, CAHE, A&S, PSL); Knowledge Representation, Logic and Advanced Programming (A&S); Cognitive Neuroscience Psychology Group.

3.9.3 Natural Resource Sustainability and Renewal

Mission: To support vibrant economic development through development of technologies and strategies to build sustainable water, energy, and land resources and to ensure their efficient use for New Mexico's future growth.

Membership: 175 members, 35 units

Subclusters: Water Science and Education**,** Lands**,** Energy.

Research Centers: Institute for Energy and the Environment, IEE (COE); Water Resources Research Institute, WRRI; Soil, Water, Air Testing Lab (CAHE); Water Task Force (CAHE, COE); Range Improvement Task Force (CAHE); Natural Resources Economic Analysis Group (CAHE, COB); Jornada Experimental Range.

3.9.4 Southwest and Border Regions Health, Education, Culture, and Development

Mission: Document, research, and offer solutions to address the many health, education, social, and economic needs of residents on both sides of the U.S.-Mexico border in close collaboration with government, private, and non-profit agencies and organizations.

Membership:90 members, 43 units

Subclusters: Health Disparities and Education, Environmental Issues, Border Crossings, Development.

Research Centers: Water Resources Research Institute, WRRI; Range Improvement Task Force (CAHE); Natural Resources Economic Analysis Group (CAHE, COB); Jornada Experimental Range; Office of International Programs; Border Epidemiology Center (CHSS); Southwest Border Consortium.

3.9.5 Twenty-first Century Space and Aerospace

Mission: Form a mutually-supportive group of educators, researchers, and practitioners to advance 21st century space-related opportunities for research, teaching, and economic development at NMSU and in the region.

Membership: 20 members, 10 units

Subclusters: Space Science, Space Engineering, Aeronautical Engineering, STEM Education.

Research Centers: Physical Science Laboratory (UAV, Balloons); RioRoboLab Robotics (COE); Astrophysical Research Consortium/Apache Point Observatory (A&S); Nanosatellite Design Lab (COE); NM Space Grant Consortium; Sensor Design Group.

3.9.6 Threat Reduction Capabilities

Surveillance:

- Physical Science Laboratory's (PSL) UAV flight operations using an Israeli-made Aerostar.
- PSL/Klipsch School of Electrical and Computer Engineering's project to extend lifetime of distributed sensor networks in collaboration with LANL scientists.
- PSL Natural Language Processing Group's years of experience in developing multilingual Information Extraction and Information Retrieval in Arabic, Chinese, Korean, Persian (Farsi), Urdu, and other languages specified by interest for the intelligence community.

Note: NMSU's capabilities are strengthened due to it's closeness to the U.S.-Mexico border and collaborative activities at the Santa Teresa Port of Entry with partners SAIC, General Dynamics, and Brandes Associates.

Situational Awareness:

- Researchers in PSL are working to automatically analyze and fuse the data obtained from sensor platforms designed to detect chemical, biological, radiological/nuclear, and explosive (CBRNE) threats into a composite database to provide an integrated picture and enhanced situational awareness.
- Another team at PSL works in war gaming and combat simulation, weapon systems modeling and simulation, atmospheric and battlefield effects modeling and simulation, and agent-based information assessment simulations. This group has gained experience and knowledge in physical and mathematical algorithm research, design, development, and implementation, and a variety of 2-D and 3-D visualization tools to produce synthetic scenes.

Note: For a border environment, the modeling and simulation capabilities can be used to achieve a common operating picture to support command and control in the coordination of people, infrastructure and resources required to achieve operational control.

Situational Management:

Cognitive Systems and Decision Sciences:

- PSL's Information Sciences and Security Systems research team has extensive experience in the area of Human-Computer Interaction. The team also has examined in detail how extreme conditions (cold, heat, stress, humidity, etc.) affect cognitive performance. Most situations in which situation management is important, such factors are likely to be present. Designing systems that take into account the degradation in performance under these situations is vital.

Information Management:

- PSL's Natural Language Processing group has extensive experience in developing automatic machine translation and data mining (pulling needed information from an unstructured body of text.
- The group also has experience in multilingual information extraction, information retrieval, information extraction, text summarization, and question answering.

- Languages with resources of various types including lexicons, morphological analyzers, semesters, etc.: English, Mandarin, Arabic, Persian, Dari, Korean, Urdu, Somali, Russian, Serbo-Croatian, Turkish, Japanese, Chechen, Amharic, Guarani, Uyghur, Burmese, and Maguindanao.

  Note: Much information comes in the form of unstructured text, and that in a variety of formats and languages. Management of such large amounts of involves various natural language processing (NLP) techniques. NLP addresses a broad spectrum of issues such as information retrieval and extraction, summarization, machine translation. Such research is oriented toward understanding human languages, with their qualitative and quantitative challenges. Enhancing these capabilities is essential for a dynamic world in which the U.S. is no longer isolated geographically or geopolitically. DTRA's aim of identifying and reducing/eliminating requires NLP as one of the core components of the threat identification task.

3.9.7 Physical Science Laboratory (PSL)

Information Modeling, Threat Analysis, and Battlefield Analysis Tools:

- Software Engineering
- Weapon System Modeling
- Battlefield Obscurant Testing and Characterization
- Information Operations
- Vulnerability Assessment
- Interactive Simulations
- Synthetic Environments

LANL-NMSU Water Security Project:

- Efficient and rapid techniques to concentrate and detect biological and other contaminant molecules in drinking water and other systems.
- Cost-effective and efficient water treatment systems for removing biological and other contaminants from drinking water.
- Molecular-level modification of CNT-based materials synthesized at LANL for water security applications.

3.9.8 Center for Research Excellence in Bioinformatics and Computational Biology (CREST)

- Established through a five-yr, $4.5 million grant from the NSF-CREST program that brings together researchers/educators from various NMSU departments: Computer Science, Biology, Chemistry and Biochemistry, Plant and Environmental Sciences, Mathematics, etc.
- Partnership with National and International Institutions
- Additional funding ~$500K from NMSU to support Outreach programs, Graduate Students, and Program Coordinator

3.9.9 Electrical & Computer Engineering

- Sensor Networks
- Near- and deep-space communication: Frank Carden Chair in Telemetering and Telecommunications - Prof. S. Horan

- Analog VLSI
- Soft computing
- Applied optics
- Digital and image processing
- Microwave engineering
- Particle Astrophysics Lab
- Medical applications: Electrical Defibrillation
- Electrical Utility Management: PNM Endowed Chair - Prof. S. Ranade

3.9.10 RioRoboLab

- Advanced Robotics and Intelligent Systems Development: RioRoboLab is developing a revolutionary technology to automatically repair atmospheric leaks caused by space debris and micrometeorites in future crew exploration vehicles and space habitats. The technology includes carbon nanotube sensors for acoustic, moisture, and thermal sensing.
- Biometric Identification: RioRoboLab and JPL currently are investigating a fast, revolutionary 3-D imaging technology for deployment at border checkpoints and at airport security checkpoints for human identification. The technology includes a real-time neural network to identify human ear signatures.

Any particular research center at NMSU may be reached through the Associate VP for Research, Wynn Egginton at (575) 646-3592.

3.10 UNIVERSITY OF NEW MEXICO

Note: All University of New Mexico research labs may be found online at: http://www.unm.edu/research.html

3.10.1 Center for High Technology Materials (CHTM)

CHTM's mission is one of research and education at the boundaries of two disciplines. The first, optoelectronics, unites optics and electronics, and is found in CHTM's emphasis on semiconductor laser sources, optical modulators, detectors, and optical fibers. The second, microelectronics, applies semiconductor technology to the fabrication of electronic and optoelectronic devices for information and control applications. Examples of these unifying themes at work are Si-based optoelectronics, and optoelectronics for Si manufacturing sensors.

Today CHTM comprises 60 graduate students, 15 faculty, 17 research faculty, and 15 technical and administrative staff. CHTM is now housed in a modern building and boasts a comprehensive range of facilities and equipment that help keep CHTM a world recognized research center. CHTM research groups have graduated 106 Masters and 97 Ph.D. students since 1983 and published more than 800 scientific papers.

Contact
CHTM Receptionist: (505) 272-7800

3.10.2 Center for Micro Engineered Materials (CNEM)

Mission: To provide a focal point for materials science research and education at UNM and to develop new, interdisciplinary technologies to make the United States more competitive in

ceramic science, engineering nanoscience, and to transfer these technologies to industry to foster the development of competitive, reproducible ceramic, polymer/ceramic composite, and nanomaterials for advanced, high performance systems.

Research: The research performed by the CMEM faculty is highly leveraged because of close collaboration with research scientists from Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL) and the Sandia Center for Integrated Nanotechnology (CINT). The Center owns or has access to state-of-the-art facilities to synthesize and characterize a broad range of materials including a one-of-a-kind Small-Angle X-ray Scattering Center. The CMEM has close ties to the UNM/Rutgers Ceramic and Composite Materials Center, CCMC, a NSF I/UCRC. It also provides leadership for the State of New Mexico NSF EPSCoR initiative in nanotechnology and the development of a Ph.D. degree granting Nanomaterials and Microsystems graduate program.

Contact
CNEM Receptionist: (505) 277-2833

3.10.3 Center for High Performance Computing (HPM)

Mission: To support faculty-led, computing-based research throughout the University of New Mexico. Our goal is to provide the infrastructure and facilities needed to continue the growth of computing-based research at UNM. We strive to foster new, interdisciplinary collaborations, based on computation and to encourage novel applications of computation in research while continuing to grow traditional applications of computing in the science and engineering disciplines.

The UNM research community is making extensive use of computing in their research activities. The ARTS (Art, Research, Technology, and Science) Lab represents an exciting confluence of art and technology with an emphasis on computation. ARTS Lab was created in response to New Mexico Governor Bill Richardson's Media Industries Strategic Plan (MISP).

Contact
HPM Receptionist: (505) 277-8249

3.10.4 Art, Research, Technology, and Science (ARTS) Lab

Mission: The ARTS Lab is an interdisciplinary center for developing creative relationships connecting Art, Science, Business, and Technology in New Mexico's unique environment. The ARTS Lab vision is to be a key catalyst for education and research that will grow and sustain an advanced media industry in New Mexico.

Overview: ARTS Lab was created in response to New Mexico Governor Bill Richardson's Media Industries Strategic Plan (MISP). ARTS Lab seeks to support innovation and growth in areas such as film, new media, simulation, telehealth, game technology, image processing, scientific visualization, national security applications, and new markets for content. As a center for both technology and the arts, New Mexico provides a dynamic environment for programs that stimulate economic development. ARTS Lab finds opportunities to cultivate these assets by utilizing an interdisciplinary approach, encouraging ongoing participation across the University of New Mexico campus as well as building on ties with industry, community, and other educational institutions.

Facilities: While ARTS Lab activities take place throughout UNM and the surrounding community, the heart of ARTS Lab is our "Digital Media Garage," a black box space outfitted to support performance, experimentation and research in digital graphics, sound and real time immersive projection systems. The 'Garage' includes a 15' diameter hemispheric domed projection surface (the G-Dome), a Vicon Motion Capture system, 30' x 40' Green Screen Studio, AV production suite and more. ARTS Lab also supports computer labs in several locations on the UNM campus or affiliated with UNM, including labs in Art, Music, Media Arts, Photography, Theater and Dance, Communication & Journalism and Continuing Education.

Contact
ARTS Lab Receptionist: (505) 277-2253

3.10.5 Center for Rapid Environmental Assessment and Terrain Evaluation (CREATE)

The Center for Rapid Environmental Assessment and Terrain Evaluation (CREATE), is headquartered on the campus of the University of New Mexico. The Center acquires near real-time remotely sensed data from environmental satellites and stores these data within CREATE's computational facilities. CREATE provides rapid assessment of changing environmental conditions specifically in the State of New Mexico and generally across a region ranging from Panama on the south to Canada on the north and from the Pacific to Atlantic Oceans.

The research center develops methods to acquire, process, analyze and deliver environmental data to end users with a goal of reducing data lag times from the current weeks to less than two hours. These data sets will be used to support existing Decision Support Systems in hydrology, meteorology, ecology and climatology as well as providing the research framework and data required to generate the next generation of DSS's using NASA data sets and assets.

3.10.6 Bureau of Business and Economic Research (BBER)

Mission:

- Contribute to the understanding of economic and demographic issues in New Mexico**.**
- Collect and disseminate information, provide technical expertise and analyze and conduct applied research for a diverse constituency including community organizations, businesses, labor unions, government officials, academia, students and others.
- Through these efforts BBER will further the public service and educational missions of the University of New Mexico and contribute to the economic well-being of New Mexico residents.

Vision: BBER maintains the highest standards for quality, objective data collection, information dissemination, and research. These high standards build an unimpeachable reputation, making BBER New Mexico's leading authority on economic conditions and the official source of demographic information and research.

Goals:

- Provide access, awareness, and understanding regarding demographic, economic, and social data.
- Foster and sustain a rigorous and broad-based economic and demographic research program for the benefit of New Mexicans.
- Initiate communication, cultivate, and maintain collaborative relationships with a broad-based spectrum of agencies and constituencies.
- Put BBER's finances on a sound foundation.
- Establish a continuing program for the professional development of BBER staff.

Contact
BBER Receptionist: (505)277-2216

3.10.7 Health Sciences Center Office of Research

The Office of Research supports the research efforts of the faculty and staff of the University of New Mexico School of Medicine (UNM SOM) by managing and sustaining research relationships within UNM and between UNM and external biomedical research organizations. This benefits research efforts in the SOM by leveraging scientific sophistication, augmenting grant competitiveness, expanding scientific critical mass, and providing a stable stream of research projects.

Contact
Office of Research Receptionist: (505) 272-6950

3.10.8 Alliance for Transportation Research (ATR) Institute

The ATR Institute is guided by the basic tenet that transportation research should promote a national and statewide investment in sustainable intermodal transportation systems that move people and goods. The ATR Institute adopts the policies described in the Intermodal Surface Transportation Efficiency Act and builds its emphasis areas to encompass a holistic approach to transportation research.

It is essential that transportation researchers, planners, and administrators realize the social, economic, equity, and environmental implications of building and maintaining a transportation infrastructure for the long term. Whether the emphasis is materials research, policy analysis, data quality, or information systems, the research services provided by the ATR Institute look for the balance between science and innovation, economics and equity, and environment and technologic advances.

Contact
ATR Receptionist: (505) 246-6410

3.10.9 Institute of Meteoritics

The Institute of Meteoritics (IOM) is a premier research institution for study of early solar system and planetary evolution. Founded in 1944, the IOM was one of the first institutions in the world devoted to the study of meteorites. Research in the IOM focuses on a wide variety of extraterrestrial materials and takes advantage of state-of-the-art laboratory facilities housed within IOM and the Department of Earth and Planetary Sciences. The IOM

meteorite collection now totals more than 600 different meteorites and is an extremely valuable asset for researchers worldwide.

Research Areas:

- Microbeam studies of Planetary Materials, including meteorites and Moon rocks
- Experimental studies at high pressure and high temperature constraining planetary materials formation processes
- Simulation of martian surface processes using low-temperature geochemical experimentation and theoretical modeling
- Impact and cratering studies, both on Earth and other terrestrial bodies
- Participation in current and upcoming robotic exploration missions, especially to Mars and the Moon

Contact
Institute of Meteoritics Receptionist: (505) 277-1644

3.10.10 Institute of Public Law

The Institute of Public Law (IPL) at the University of New Mexico School of Law engages in research, analysis, teaching, training, writing, and publishing to support the development of informed public policy and law. Founded in 1969 as the public service arm of the law school, the Institute provides assistance to state, local, and federal government, and undertakes special projects through foundation grants. It forms an important link for New Mexico's only law school with government entities and the community at large. The Institute includes the Corinne Wolfe Children's Law Center, the Transportation Safety Law Center, the Judicial Education Center, and the Center for Wildlife Law.

The Institute has long contributed to the University's tradition of government and community service. Themes that run through their work include commitment to assisting public officers achieve excellence in government, interest in communicating public law and policy to diverse groups and individuals, and commitment to an informed and involved citizenry. IPL often uses an interdisciplinary approach, working closely with other University departments, government staff, community groups, and the private sector. Institute staff include lawyers, educators, writers, newsletter designers, and conference planners. They conduct legal research, organize and teach at conferences and seminars, publish manuals, newsletters and online educational resources, arrange public meetings, and license and monitor traffic safety schools.

Contact
Institute of Public Law Receptionist: (505) 277-5006

3.10.11 Institute for Space and Nuclear Power Studies

Mission: Whether they are employed in space or on Earth, new uses for nuclear energy continue to emerge year upon year, promising exciting benefits to humankind for generations to come. The Institute for Space and Nuclear Power Studies is at the forefront of the technological revolution in peaceful uses for nuclear power that will:

- Create efficient, dependable reactors designed to power bases on the Moon and Mars, and extend our knowledge of deep space using unmanned spacecraft traveling to the farthest reaches of the solar system and beyond.
- Build safe, cost-effective commercial reactors for use in underdeveloped nations where electricity and power are not yet universally available.
- Reduce nuclear waste generated by today's nuclear reactors, through an advanced fuel cycle that alters the half-life of existing reactor by-products and renders them non-radioactive in hundreds rather than thousands of years.
- Develop the next generation of commercial nuclear power plants for meeting ever-growing global needs for environmentally friendly electricity production and the generation of hydrogen fuel for industrial applications and transportation.

Research teams at ISNPS-UNM are developing three space reactor designs that avoid single-point failures and provide a high degree of reliability. These designs are: the liquid metal-cooled Sectored Compact Reactor (SCoRe), the gas-cooled Submersion-Subcritical Safe Space reactor (S^4), designed to operate with multiple Closed Brayton Cycle (CBC) Engines; and the liquid metal heat pipe cooled Scalable AMTEC Integrated Reactor System (SAIRS). Redundancy is built into each reactor design to ensure continued operation of the power system for in excess of 10 years, operations safety, and longevity.

Contact
Institute for Space and Nuclear Power Studies Receptionist: (505) 277-0446

3.11 NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

Note: All New Mexico Institute of Mining and Technology research labs may be found online at: http://www.nmt.edu/research.

3.11.1 Bureau of Geology and Mineral Resources

The New Mexico Bureau of Geology and Mineral Resources, established by legislation in 1927, is a service and research division of the New Mexico Institute of Mining and Technology (NM Tech). It acts as the geological survey for the State of New Mexico with these main goals:

- Conduct research and interact with State and Federal agencies and industry to facilitate prudent exploitation of the state's geological resources.
- Distribute accurate information to scientists, decision makers, and the New Mexico public regarding the state's geologic infrastructure, mineral and energy resources, and geohydrology (including water quantity and quality).
- Create accurate, up-to-date maps (using GIS) of the state's geology and resource potential.
- Provide timely information on potential geologic hazards including earthquakes, volcanic events, soils-and subsidence-related problems, and flooding.
- Act as a repository for cores, well cuttings, and a wide variety of geological data. Provide convenient physical and internet access for New Mexicans to such resources.
- Provide public education and outreach through college teaching and advising, a Mineral Museum, and teacher- and student-training programs.
- Our staff serve on a number of boards and commissions within the state and the region concerned with various geoscience-related issues.

Contact
Bureau of Geology and Mineral Resources Receptionist: (575) 835-5420

3.11.2 Energetic Materials Research and Testing Center (EMRTC)

The Energetic Materials Research and Testing Center (EMRTC), affiliated with New Mexico Tech, is internationally recognized and has over fifty years of expertise in explosives research and testing. EMRTC specializes in the research, development, and analysis of energetic materials for both corporate and government clients.

As one of several research divisions of New Mexico Tech, EMRTC has access to university faculty with experience in a wide variety of scientific and technical disciplines. EMRTC's 40-square-mile field laboratory is located in the mountains adjacent to the New Mexico Tech campus in Socorro, New Mexico. The field laboratory contains over 30 test sites, gun ranges, storage sites, and other research facilities, allowing for a complete spectrum of research and testing activities.

EMRTC provides training programs for safety in handling explosives in research and response to incidents involving explosive materials. The courses provide technical level training for personnel who have a significant responsibility in the research of explosives or providing response to incidents involving explosives. New Mexico Tech provides expert instructors, field facilities for actual tests, and hands-on laboratory instruction. Government agencies and companies utilize these courses to certify personnel to perform and work with explosive operations.

Contact
EMRTC Receptionist: (575) 835-5312

3.11.3 Playas Training and Research Center

(2008). Playas Training and Research Center. Retrieved March 4, 2008, http://www.emrtc.nmt.edu/playas/

The Playas Training and Research Center (PTRC) in southwestern New Mexico is a unique Center of Excellence providing training, operational support and research, development, test and evaluation in a real world environment for customer organizations using our experience, expertise, and facilities to develop, evaluate, and deploy techniques and technologies to improve the safety, security, and global quality of life.

3.11.4 GO (Gas and Oil) Tech / Petroleum Recovery Research Center (PRRC)

GO-TECH is New Mexico Tech's primary Web resource for oil and gas information. GO-TECH includes a searchable NM oil and gas production database, a well-info database, a database of information for state oil and gas leases, GIS pool maps, production data plotting tools, downloadable software, current price sheets, lease notices, and petroleum links.

Much of GO Tech's resources come from the Petroleum Recovery Research Center (PRRC). The PRRC of New Mexico Tech is regarded both nationally and internationally as one of the nation's leading petroleum research centers. PRRC was established by the New

Mexico State Legislature in 1977 to conduct both basic and applied research designed to improve recovery of petroleum and natural gas.

Mission: Our mission is to serve as New Mexico's focal point for improved oil and gas recovery research, to assist others in their efforts to recover petroleum, and to transfer new and existing technology from our research labs to the oil and gas industry.

Contact
PRRC Receptionist: (505) 835-5142

3.11.5 Institute for Complex Additive Systems Analysis (ICASA)

The Institute for Complex Additive Systems Analysis (ICASA) is a cooperative alliance among academia, industry, and government. ICASA's basic research focus is to understand the additive effects—or unintended consequences—of efficient design in interdependent groups of systems. Research is pursued through the following strategic thrusts: conducting basic research on complex additive systems; applying research to real-world problems in the private and public sectors; developing key enabling technologies; and establishing training and education programs. The Institute's research is characterized by the study of dynamical systems, control theory, mathematical physics, and economics using the tools of theoretical analysis, modeling, and simulation.

The primary function and goal of ICASA is to assist and encourage the training and education of future analysts, scientists, and engineers in conjunction with the formal degree programs at New Mexico Tech (NMT). In 2001, The NMT Information Technology (IT) program—jointly managed by the computer science and management departments—became the first integrated program. This program combines elements of the computer science, engineering, and management departments. In 2002, the National Security Agency (NSA) and Department of Homeland Security (DHS) named the IT program a Center of Excellence in Information Assurance.

Contact
ICASA Receptionist: (505) 835-5926

3.11.6 Institute for Engineering Research and Applications

Mission: To perform focused research and to plan, develop and implement specific technologies and activities that will provide for safe and effective use and protection of resources both now and in the future.

Research Clusters: Environment: Engineering and Planning for water Systems; Power and Energy: Advanced thermionic converter R&D, Micro-propulsion for small satellites, High temperature high vacuum experiments, Plasma simulation, Gas switching, Pulsed power; Homeland Defense: Chemical/Bio sensor technology, Analysis of random structural systems.

Approach:

- A dynamic and growing institute focused on client requirements and deliverables
- Full-time professional research staff across a broad range of disciplines

- Draws upon the expertise of other research centers and academic units within the university
- Access to a broad base of faculty competencies and students
- Frequently teams with industrial partners

Contact
Institute for Engineering Research and Applications Director: (505) 924-7027

3.11.7 Incorporated Research Institutions for Seismology (IRIS)

The Incorporated Research Institutions for Seismology is a university research consortium dedicated to exploring the Earth's interior through the collection and distribution of seismographic data.

IRIS programs contribute to scholarly research, education, earthquake hazard mitigation, and the verification of a Comprehensive Test Ban Treaty.

Support for IRIS comes from the National Science Foundation, other federal agencies, universities, and private foundations.

The Data Management System of IRIS is tasked with archiving seismic data from many sources. Most of the data stored at the Data Management Center in Seattle can be categorized as passive source seismic data collected by broad-band instruments. However, the DMC also stores some active source data and data from non-seismic instruments.

Contact
Incorporated Research Institutions for Seismology Receptionist: (202) 682-2220

3.11.8 Microelectronics Testing and Technology Obsolescence Program (METTOP)

Overview: The MicroElectronics Testing and Technology Obsolescence Program (METTOP) at New Mexico Tech has been developed to address the challenges faced by customers whose systems are impacted by DMSMS.

METTOP's technical abilities and testing facilities provide cost effective testing of advanced microcircuits for a variety of customers with diverse technical interests. Our specialty is evaluating the effects of nuclear and space radiation on memory devices.

Facilities: METTOP provides test planning, facility scheduling, test conduct, analysis, and report generation services as a full-service test house. In association with other test facilities in the Rio Grande corridor (White Sands Missile Range, Sandia National Laboratories, Air Force Research Laboratory), METTOP provides a full complement of radiation testing services.

At the METTOP facility, test and research engineers operate state-of-the-art electronic test equipment including two mainframe mixed-signal testers that can characterize parts with up to 768 pins. In conjunction with the New Mexico Tech Electrical Engineering and Materials and Metallurgical Engineering departments, METTOP can provide a wide range of services including environmental testing, scanning electron microscopy, and materials analysis of semiconductor devices.

Contact
METTOP Receptionist: (575) 835-5895

3.11.9 New Mexico Center for Energy Policy (NMCEP)

The New Mexico Center for Energy Policy (NMCEP) is the first community-centered response to the challenge of national energy security in the United States. Its location in Lea County reflects the New Mexico Southeast as a historic and contemporary source of energy production and technology. Energy policy-making in Washington and in state capitals is often limited to "witness" appearances from "locals". Energy policy developed and promoted by an energy production community has been non-existent until now.

NMCEP (nim-sep) represents a diversified energy production and infrastructure community (DEPIC).The economic reality in Lea County and the region includes natural gas, oil, wind, solar, bio-fuels, and nuclear energy. There is also presence of carbon dioxide that can be transformed into feedstock for fuel from capture or sequestered (stored underground). Diversified energy supply is a natural endowment: it rejects "either /or" (renewable vs. non-renewable) policy choices and mandates.

Contact
NMCEP Receptionist: (505) 492 2784

3.11.10 National Radio Astronomy Observatory (NRAO)

Radio astronomy has profoundly changed and enlarged our understanding of our Universe, enabling new discoveries, opening new celestial windows, revealing an otherwise invisible Universe.

Founded in 1956, the NRAO provides state-of-the-art radio telescope facilities for use by the international scientific community. NRAO telescopes are open to all astronomers regardless of institutional or national affiliation. Observing time on NRAO telescopes is available on a competitive basis to qualified scientists after evaluation of research proposals on the basis of scientific merit, the capability of the instruments to do the work, and the availability of the telescope during the requested time. NRAO also provides both formal and informal programs in education and public outreach for teachers, students, the general public, and the media.

The NRAO is funded by the National Science Foundation (NSF) under the terms of a cooperative agreement between the NSF and Associated Universities, Inc. (AUI), a science management corporation.

Astronomical observations at radio wavelengths allow scientists to address fundamental questions about our Universe such as:

- When and how did galaxies form in the early Universe?
- How do supermassive black holes form at the hearts of most galaxies?
- How are stars and planets born?

Contact
NRAO Receptionist: (575) 835-7000

3.11.11 Technology Transfer Support Group (TTSG)

There has been an increasing need for the Phillips Laboratory to transfer technology to small business firms over the past several years. During this same period the State of New Mexico and the Phillips Laboratory, which was recently incorporated into the new Air Force Research Laboratory as the Phillips Research Site (AFRL-Phillips Research Site), have established a relationship that successfully supports the cooperative and joint activities of the laboratory to transfer technology to small businesses and those public and private organizations that enhance small business development. The State Laws of New Mexico, Chapter 216, designate the New Mexico Economic Development Department (NMEDD) as the lead agency for technology transfer conversion for all public and private sector organizations within the state.

Under the Memorandum of Understanding, the following objectives were developed for the seven-year period of performance:

- Identify technological assets and mechanisms available at Phillips Research Site for technology transfer to small business and those public and private organizations that foster small business development;
- Develop and execute a marketing plan for the effective technology transfer of Phillips Research Site's technologies to small businesses and those public and private organizations that foster small business development; and
- Develop and document successful technology transfer to small businesses and those public and private organizations involved in fostering small business development.

Contact
TTSG Marketing Director: (505) 846-8056

3.12 AEROJET

(2008). Aerojet capabilities. Retrieved January 28, 2008, from http://www.aerojet.com/capabilities/index.php

Aerojet is an aerospace and defense company specializing primarily in missile and space propulsion, and defense and armaments. As the second leading provider in solid and liquid propulsion systems, and the leading provider in the tactical area of solid propulsion, Aerojet meets emerging defense and aerospace propulsion needs. Their capabilities include a wide range of defense and aerospace products.

Areas inside the company include advanced structures, air breathing propulsion, fire suppression systems, missile defense propulsion, spacecraft propulsion, and warheads and energetics.

The Supplier Diversity Program at Aerojet aims to give small businesses the opportunity to provide their products to Aerojet. They are interested in hearing from owners of small, HUBZone, woman-owned, disadvantaged, and veteran-owned businesses.

Aerojet has an operating location in Socorro, New Mexico.

3.13 RAYTHEON

(2008). Raytheon. Retrieved January 28, 2008, from http://www.raytheon.com

Raytheon is a global company focusing on defense, homeland security, and other government related market. They provide products and services in six areas: Integrated Defense Systems, Intelligence and Information Systems, Network Centric Systems, Technical Services, Missile Systems, and Space and Airborne Systems.

Part of the Raytheon Missile Systems area is located in Farmington/Navajo Nation, New Mexico. In this specialization, missile systems are designed, developed and produced for the United States military and our allies. These systems include air-to-air strike, land combat missiles, guided projectiles, directed energy weapons, and naval weapon systems.

The Small Business Innovation Research Program (SBIR) is a program in which Raytheon partners with small businesses to help with projects as well as build up the growth of small businesses in newer technologies.

3.14 GOODRICH CORPORATION

(2007). Aerospace and defense capabilities. Retrieved January 29, 2008, from http://www.goodrich.com/pdf/Capabilities.pdf

Goodrich Corporation is an international company that supplies systems and services to the aerospace, defense, and homeland security markets. They offer a broad range of products and services for airline companies, the military, and engine manufacturers around the world. Their goal is to offer systems and services to make an aircraft more efficient and easier to maintain. Products include landing gear, sensors, electrical systems, flight controls, fuel injection systems, and many others. They supply equipment and services for engines, helicopters, military aircraft, and commercial airlines. Goodrich parts are used on nearly every aircraft in the world.

Goodrich believes that small businesses should have the maximum reasonable possibilities to participate in contracts given to the company. Small, disadvantaged, HUBZone, veteran-owned, and woman-owned businesses are encouraged to contact them and find out if they can become a supplier.

Goodrich Corporation's Space Flight Systems and Intelligence, Surveillance, and Reconnaissance (ISR) Systems sectors are located in Albuquerque, New Mexico.

3.15 GE AVIATION

(2008). Systems and capabilities. Retrieved January 29, 2008, from the http://www.geaviationsystems.com/Systems---/index.asp

xxxxGE Aviation is the leading producer of large and small jet engines for military and commercial aircraft in the world. In addition to jet engines, GE produces many other parts crucial to the performance of the aircraft. Systems and capabilities of GE Aviation include aircraft structures, displays, electrical power systems, electromechanical systems, electronic components, flight control actuation, flight management systems, information systems, landing gear systems, mission management systems, modular processing systems, propellers, and refueling.

GE Aviation's Supplier Diversity Program ensures that small and diverse businesses are identified and get an opportunity to participate in GE Aviation's contracts.

Albuquerque, New Mexico is the location of one of GE Aviation's Manufacturing centers.

3.16 BOEING SVS

(2008). About us. Retrieved January 29, 2008, from http://www.boeing.com/companyoffices/aboutus/index.html

Boeing is the leading aerospace company in the world and the largest manufacturer of military and commercial aircraft combined. They also design and manufacture many other things useful for national security such as satellites, missiles, launch vehicles, communication systems, and electronic and defense systems. Boeing operates the International Space Station and the Space Shuttle, and as one of the U.S.'s top exporters, provides services to over 90 countries.

Boeing looks for small and diverse businesses that can bring innovation, strength, and flexibility to the company. They recognize that their utilization of small and diverse businesses makes them leader in aerospace companies.

In 2000, Boeing bought Albuquerque, New Mexico based company SVS, which specializes in electro-optics. SVS provides precision acquisition, tracking, pointing, and imaging products for many Department of Defense programs.

3.17 HONEYWELL AEROSPACE

(2008). Honeywell Aerospace. Retrieved February 4, 2008, from http://www51.honeywell.com/aero/

Honeywell Aerospace is an international company specializing in engines, systems, service solutions, and integrated avionics. They supply goods and services to a variety of clients like airplane manufacturers, airlines, military, and space and airport operations. The goals of Honeywell Aerospace are to make flight safer, more cost-effective, and more reliable with their products.

Honeywell Aerospace has an operating location in Albuquerque, NM.

The Honeywell Technology Solutions Inc. (HTSI) segment of the company offers small businesses several ways to be involved in Honeywell's aerospace activities. They are constantly looking for small businesses to use as suppliers and aim to improve their joint competitiveness. They also have the NASA sponsored HTSI mentor-protégé program, which takes small and disadvantaged businesses and develops them as contractors for NASA and other government agencies.

3.18 NORTHROP GRUMMAN

(2008). Northrop Grumman. Retrieved February 4, 2008, from http://www.northropgrumman.com/index.html

Northrop Grumman is a company that develops complex systems for use by those in the intelligence field to carry out missions on all different levels. They offer systems in three

major areas: Command, Control, and Communications; Intelligence, Surveillance, and Reconnaissance; and missile systems. Albuquerque is home to New Mexico's Northrop Grumman location.

Northrop Grumman is interested in extending subcontracting opportunities to small businesses in all different categories to help them become competitive in the aerospace market. They offer a number of different programs for small businesses, such as their mentor-protégé program and Native American Outreach program, as well as evens and conferences around the country for small businesses to participate in. They have won several awards for the opportunities they create for small business owners.

3.19 QTL BIOSYSTEMS

(2008). QTL biodetection. Retrieved January 30, 2008, from http://www.qtlbio.com/index.htm

QTL Biosystems is a company located in Santa Fe, New Mexico, specializing in developing and producing instrumentation and bioassays. Their products offer speed, sensitivity, specificity, and cost effectiveness, in easy to use formats. Products are available to test for a variety of biological compounds, such as bacteria, viruses, molds, toxins, proteins, hormones and nucleic acids, which alert medical or military personnel what is causing illness. Handheld sensors are available, and anthrax, botulism, ricin, the plague, and Staphylococcal Enterotoxin B are among the compounds that can be identified.

3.20 MESOSYSTEMS TECHNOLOGY

(2006). IcxMesoSystems. Retrieved January 30, 2008, from http://biosampling.icxt.com/index.html

MesoSystems Technology is an Albuquerque, New Mexico based company that provides products designed to detect bio-threats in public and private facilities. Currently most of their products are used in high-risk government settings, but easy to use and deployment ready sensors make them useful in a variety of places. Products include those for personal safety, critical infrastructure protection, emergency response, and building monitoring.

3.21 KRESTEL CORPORATION

(2007). Krestel corporation. Retrieved February 1, 2008, from http://www.kestrelcorp.com/index.html

The Krestel Corporation is an Albuquerque, New Mexico based research and development company. They work on developing technologies in the areas of optical technologies, biomedical technologies, and software engineering for many different customers. Customers have included the Air Force Research Lab, the Department of Energy, the Department of Defense, NASA, NATO, Pfizer, University of New Mexico, Texas Tech University, and many others. Their projects are varied, and range from things like sensors for aerospace companies to medical diagnostic and radiographic equipment.

3.22 APPLIED RESEARCH ASSOCIATES, INC.

(2006). About Applied Research Associates, Inc. Retrieved February 1, 2008, from http://www.ara.com/about/about_ara.htm

Applied Research Associated Inc. is located in Albuquerque, New Mexico, and aims to solve problems of national importance in the areas of national defense and aerospace, homeland safety and security, transportation, and commercial and consulting services. As an engineering and research company, the ARA strives to solve problems involving complex weapons, security, the environment, transportation, and readiness.

The ARA is a supporter of small businesses, and offers many opportunities to woman-owned, small-disadvantaged, disabled-veteran-owned, Historically Underutilized Business Zone, and other small businesses. Small businesses are used to develop a diverse group of suppliers and partners to better serve their customers.

4.0 CONCLUSION

This document has summarized a variety of government and private test assets that could be employed in T&E or DEMVAL of technologies relevant to the NNSA mission. When considered together, the capabilities of these resources are immense.

The next document related to DEMVAL will be a marketing and visibility plan for the test assets with two more specific focus areas forming a major part of the assessment for the plan. First, geographically, assets that are primarily in the southern part of New Mexico will be further analyzed. Second, the technology or capability focus will be primarily toward:

- UAS and unique payloads and subsystems that Unmanned Aircraft might employ
- Image processing
- Specialized databases and information processing
- Early detection and surveillance of proliferation activities
- International border monitoring for transport of nuclear materials
- Robotic technologies for the handling and cleanup of nuclear materials
- Distributed Information Systems for nuclear complexes

Also as important, the specific NNSA requirements will be matched in the second document against capabilities identified in New Mexico. This important assessment component will help assure value added in the document and applicability by small business with a technology and security orientation.

The NSPP will constantly be monitoring and assessing synergy with other exiting programs. Relevant data will be included as updates to the marketing and visibility plan.

A Users Guide will be produced as the third document related to the DEMVAL function of the NSPP. The guide will include basic instruction on how technologists can utilize the discussed assets. Formal agreements with the various locations will be developed to facilitate user interaction.

These three DEMVAL documents will form the basis for organizations and programs to understand the assets available in New Mexico and the processes to utilize them. Periodic surveys of the State's capabilities will ensure that the documents have the most recent and relevant information for the users.