

*Exceptional service in the national interest*



# Sandia 2008

*A place where science, technology,  
and national security intersect*



★ *‘Exceptional service in the national interest’ since 1949*

Sandia was born out of America’s World War II atomic bomb development effort. Soon the Lab’s original mission as an ordnance design, testing, and assembly facility grew to include engineering design for all nonnuclear components of the nation’s nuclear weapons. As national security requirements have evolved, so has Sandia’s mission.



“...This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction...In my opinion, you have here an opportunity to render an exceptional service in the national interest.”

– President Harry S. Truman, in a letter to AT&T President Leroy A. Wilson, asking Bell Labs to “accept under contract the direction of Sandia Laboratory,” May 18, 1949

Keeping the United States’ nuclear stockpile safe, secure, and reliable remains an important part of Sandia’s work. But to address the more complex and dynamic national security threats facing the country today, Sandia supports nearly every U.S. government agency. The R&D carried out here influences the lives of millions of Americans.



Technologies developed at Sandia prevent the use and spread of weapons of mass destruction, protect our national infrastructures, defend our nation against terrorism threats, keep U.S. soldiers and military bases from harm, and ensure the stability of our nation’s energy and water supplies.



Sandia is managed by Sandia Corporation, a subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy’s National Nuclear Security Administration.



“Our highest goal is to become the laboratory the United States turns to first for innovative, science-based systems engineering solutions to the most challenging problems that threaten peace and freedom for our nation and the globe.”

– Sandia National Laboratories Strategic Plan

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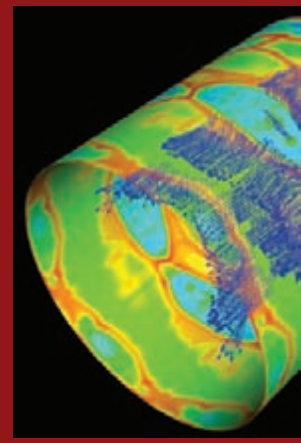
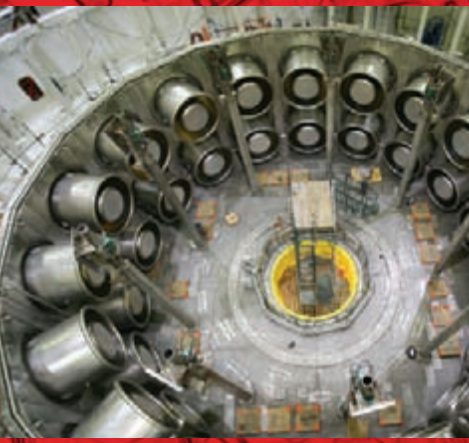
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### DID YOU KNOW?

*Over the years Sandia has pioneered such products as cleanrooms for microelectronics manufacturing, triggers for automobile airbags, military radars that see through clouds and darkness, a spray that cleans areas contaminated with chemical or bio agents, and airport portals that screen passengers for explosives.*



## Outstanding achievements, unparalleled performance

It's been an exciting year at Sandia – a year of outstanding achievements and unparalleled performance. We dedicated our MESA complex, the largest future-oriented program ever attempted at Sandia. We upgraded our Red Storm supercomputer, the most powerful general purpose computer in the world. We refurbished our Z machine, the world's largest pulsed power facility. And we completed a refurbishment of the W76 firing system, our largest nuclear weapons deliverable in many years.



Last year we met these and many other challenges. At the same time we made some enormous improvements in how we operate the laboratory. We

significantly decreased the quantity of special nuclear materials at Sandia, reducing our security costs in that area. And we committed ourselves to maintaining a safe work environment, preventing injuries before they happen.

It was indeed an exciting year at Sandia. And the next year promises to be exciting as well – as our missions continue to expand and our country faces new challenges both at home and abroad. Through it all, Sandia's plan is to continue rendering exceptional service to the nation in a stable and exemplary manner, as we have for nearly sixty years.

– Thomas O. Hunter

*President and Laboratories Director*



*“We will serve as a center for innovation and creativity – a place where science, technology, and national security intersect, where the nation’s best engineers, innovators, and educators partner to solve problems and train the next generation of scientists and engineers.”*

– Sandia National Laboratories Strategic Plan

## Sandia carries out research and development in these technology areas:

### Nuclear Weapons

Support our nation’s deterrence policy by helping sustain, modernize, and protect the United States’ nuclear arsenal.

### Defense Systems & Assessments

Supply new war fighting and assessment capabilities to our defense and national security communities.

### Energy, Resources, & Nonproliferation

Ensure stable sources of energy and other critical resources; protect critical national infrastructures; and prevent the spread of nuclear, chemical, biological, and nonconventional weapons worldwide.

### Homeland Security & Defense

Help Americans maintain their freedom, security, and

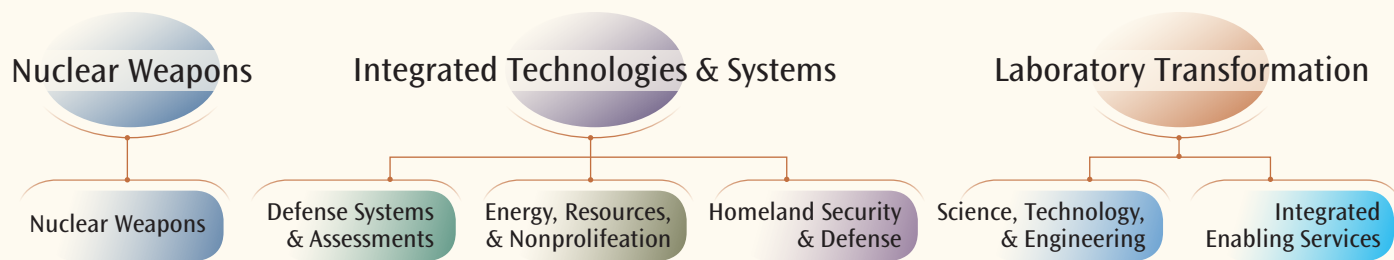
quality of life in the face of worldwide terrorism and natural disasters, and protect our armed forces and military assets at home and abroad.

### Science, Technology, & Engineering

Support Sandia’s mission areas by nurturing capabilities at the forefront of science and engineering, and through collaborative leading-edge research with universities and companies.

Sandia achieves its objectives by earning customer confidence, seeking extraordinary talent, stimulating breakthrough science and technology, and ensuring that all work is conducted safely and securely.

Sandia’s work is carried out in six Strategic Management Units (SMUs) organized under three Strategic Management Groups (SMGs).

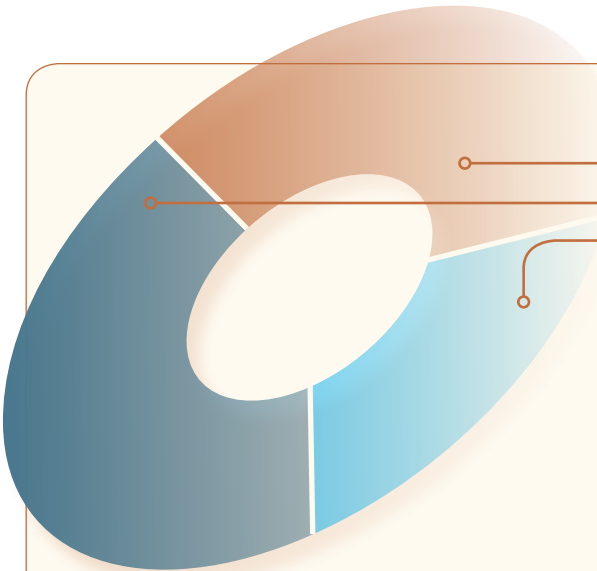




## BUDGET - PEOPLE - PLACES

# Sandia by the numbers

### FY2007 revenue by source



- DOE Weapons, \$1,009M, 42%
- WFO, \$897M, 37%
- Other DOE, \$491M, 21%

**Total \$2,398 million**

Sandia is a contractor to the U.S. Department of Energy's National Nuclear Security Administration and supports numerous other federal, state, and local government agencies, companies, and other organizations. Work for non-DOE customers is referred to as Work for Others (WFO).

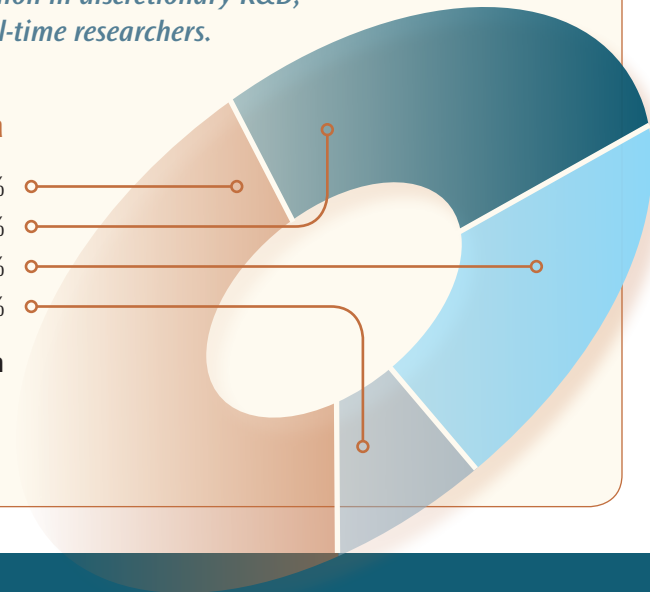
### DID YOU KNOW?

*The Laboratory Directed Research & Development program, enables Sandia to invest a portion of its revenue in research that supports its national security mission. In FY07 the LDRD program funded \$144 million in discretionary R&D, employing the equivalent of 378 full-time researchers.*

### FY2007 revenue by business area

- Nuclear Weapons, \$1,077M, 45%
- Defense Systems & Assessments, \$674M, 28%
- Energy, Resources, & Nonproliferation, \$473M, 20%
- Homeland Security & Defense, \$174M, 7%

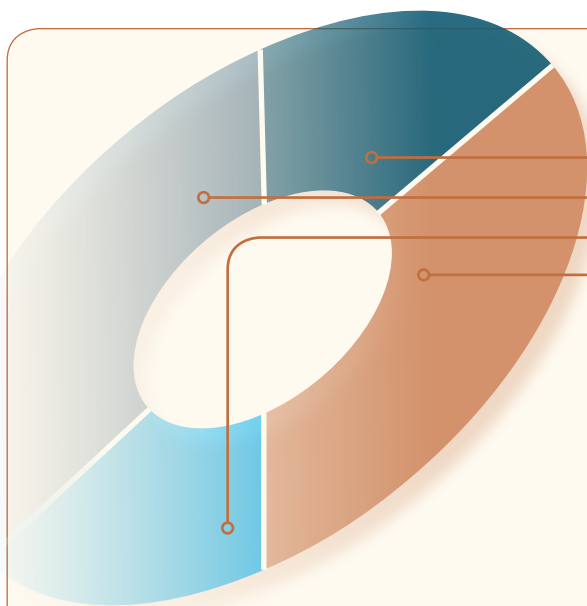
**Total \$2,398 million**





## DID YOU KNOW?

*Employees, contractors, and retirees donated almost \$4 million in 2007 to charitable organizations in Sandia's communities. They also served more than 110,000 volunteer hours in 2007, including contributing to science education.*



### FY2007 employees by degree level

- PhD, 1,532, 18%
- Master's, 2,776, 33%
- Bachelor's, 1,421, 17%
- Other, 2,777, 33%

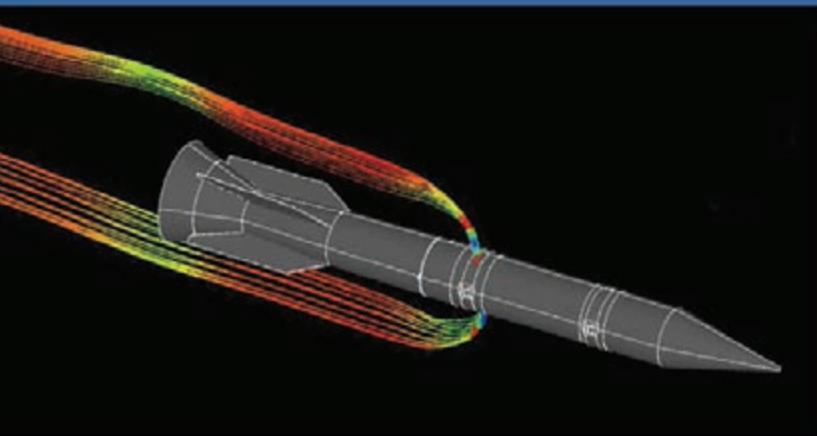
**Total 8,506**

Sandia strives to attract and retain energetic, highly qualified people with the skills needed for Sandia's future while ensuring a stable and sustainable workforce.

Although most of Sandia's 8,500 employees work at Sandia's headquarters location in Albuquerque, New Mexico, or at a second principal laboratory in Livermore, California, others are scattered among dozens of sites in the U.S. and abroad, including in Carlsbad, New Mexico; Las Vegas and Tonopah, Nevada; and Kauai, Hawaii.



Sandia's Laboratory Transformation Strategic Management Group ensures that through best-in-class financial practices, accounting standards, and internal control policies and procedures, we provide a high degree of accountability to our customers, and that Sandia uses federal funding in a way that provides the greatest national security impact possible.



“At Sandia we think of our products with regard to the weapons programs as safety, security, surveillance for confidence, survivability against threat, certification of confidence, and integration. In delivering those products we bring the best of technology to bear.”

– Joan Woodard,  
*Executive Vice President &  
Deputy Laboratories Director  
for Nuclear Weapons*

## NUCLEAR WEAPONS

# America’s nuclear weapons engineering laboratory

Sandia weaponizes the nuclear explosive package for the nation’s nuclear weapons stockpile – providing the development, qualification, and production of nonnuclear components and the integration of the components with the nuclear explosive package and military hardware. In support of weaponization, we also provide our customers with research, development, and testing services.

### Science-based engineering tools

Science-based engineering is the foundation of our work, in which fundamental science, computer models, and unique experimental facilities are brought together to understand, predict, and verify weapon-system performance.

### A special mission in safety and security

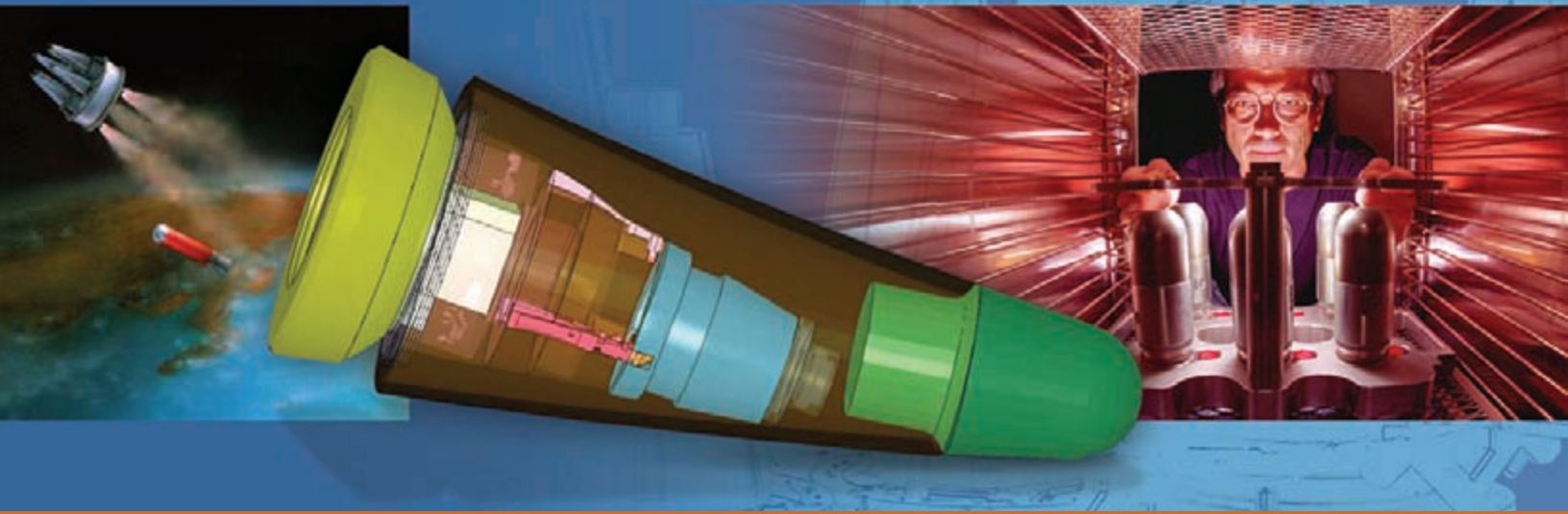
Nuclear weapon safety and security are key mission assignments for Sandia and are an important part of our role in transforming the stockpile. Safety

and security architectures are developed from science and engineering principles.



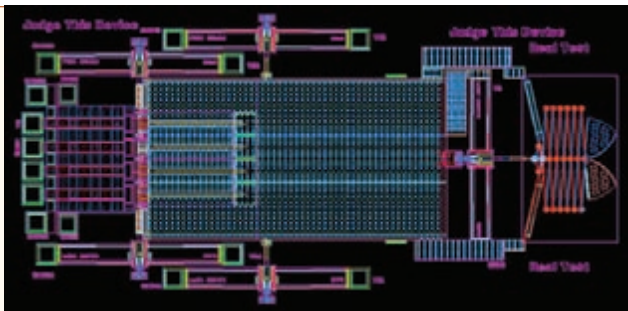
At the core of Sandia’s nuclear weapons program are those products that represent key elements of weaponization, including integrated, engineered warhead systems; arming, fuzing, and firing systems; neutron generators; gas transfer systems; and surety systems. The science foundations and development, qualification, and production activities that support these products are at the center of Sandia’s nuclear weapons program.





## DID YOU KNOW?

*Sandia is responsible for designing and developing more than 90 percent of the 3,000 to 6,500 parts in a United States nuclear weapon.*



### The nuclear weapons strategic commitment

Sandia is committed to supporting, through our leadership, the transformation of the stockpile and the nuclear weapons complex into a modern, agile enterprise that maintain strategic deterrence far into the 21st century.

## ACCOMPLISHMENTS

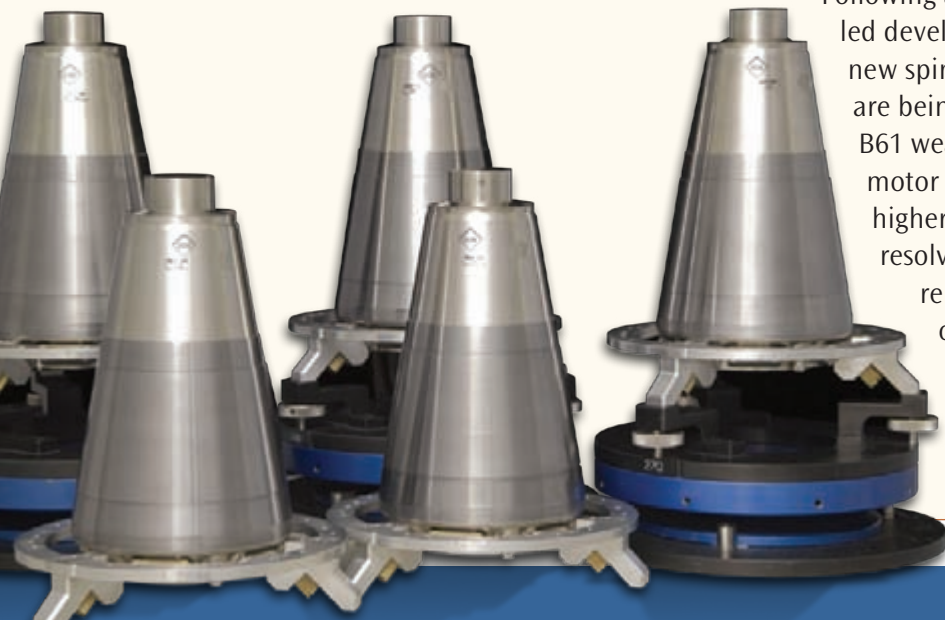
► An arming, fuzing, and firing (AF&F) system helps ensure that a nuclear weapon functions as required. Sandia delivered to the National Nuclear Security Administration the first production units of a new AF&F system for one type of U.S. nuclear weapon. The new design includes devices for enhanced nuclear detonation safety and is hardened to strategic radiation levels for hostile encounters.

► A spin rocket motor accelerates the rotation of a weapon after it is released from its delivery aircraft.

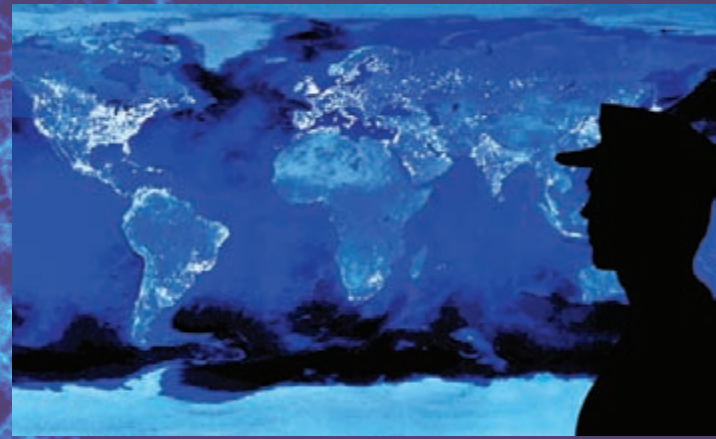
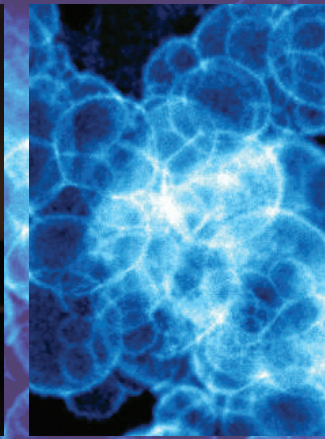
Following a four-year Sandia-led development program, new spin rocket motors are being retrofitted into B61 weapons. The new motor has significantly higher torque output and resolves potential age-related issues of the old motors.



B-2 drop test involving B61 spin rocket motor



W76-1 AF&F first production units



## INTEGRATED TECHNOLOGIES & SYSTEMS

# One lab addressing many threats

### National security threats have evolved to include...

- Cyber attacks
- Improvised nuclear devices
- Attacks on critical infrastructures
- Attacks on transportation systems
- Threats from space and to space-borne systems
- Bioterrorism
- Smuggling
- Global competition for resources
- Energy shortages
- Water shortages
- Natural disasters
- Major accidents
- Dangers of technological surprise
- Global struggles for economic, cultural, ethnic, and political dominance
- And more...

Sandia's Integrated Technologies & Systems (ITS) Strategic Management Group supports the technology needs of the nation's military and policy makers, protects the homeland, secures sources of energy and critical resources, and prevents the spread of weapons of mass destruction.

"We're in a highly interconnected world where there are more, and more complex, threats. Our role is to make sure the people who set national security policy and operate according to that policy have the technological resources they need."

– Al Romig

*Senior Vice President & Deputy Laboratories Director for Integrated Technologies & Systems*



### DID YOU KNOW?

*Since 1985 Sandia has been awarded more than 1,200 U.S. patents and has executed more than 1,400 commercial licenses for Sandia-developed intellectual property.*



## Readiness to solve the nation's most complex problems

Threats to our nation are evolving faster than ever, and our adversaries are increasingly sophisticated. Meeting tomorrow's national security challenges will require readiness and rapid innovation.

Sandia will help the nation solve complex problems with core capabilities in:

### High-performance computing

Sandia's work supports a spectrum of applications, from the assessment of weapons performance to breakthroughs in materials science. Partnerships with CRAY, Intel, and others are resulting in systems and architectures powerful enough to model highly complex phenomena.

### Extreme environments

At unique experimental facilities, test objects can be subjected to a variety of insults – radiation, acceleration, vibration, g forces, blast, extreme temperature, fire, wind velocities, drops, and simulated lightning strike, for example. Experimental results are combined

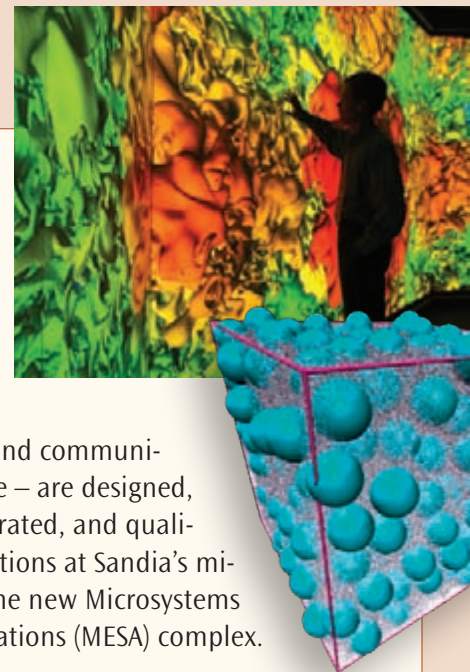
with advanced simulation capabilities to quantify performance, reliability, and safety of complex systems.

### Intelligent microsystems

Microchips that sense, actuate, and communicate – all within a single package – are designed, developed, manufactured, integrated, and qualified for national security applications at Sandia's microsystems facilities, including the new Microsystems and Engineering Sciences Applications (MESA) complex.

### Nanotechnology

Sandia researchers at the frontiers of smallness are making fundamental scientific discoveries and learning to integrate nanostructures into the micro and macro worlds. The Center for Integrated Nanotechnologies (CINT), a partnership between Los Alamos National Laboratory and Sandia, is a focal point for Sandia's nano research.



### DID YOU KNOW?

*The world's largest pulsed power driver, the Z machine at Sandia, helps scientists improve nuclear weapon surety and address fundamental science questions in planetary physics, material properties, and astrophysics.*

*Pulsed power also offers promise for providing a clean and abundant long-term energy source for the world.*

*We anticipate  
and solve our nation's  
toughest national security  
challenges.*



## DEFENSE SYSTEMS & ASSESSMENTS

# Technological superiority and preparedness



“Today our nation faces many new national security challenges, some of which, if left unattended, could threaten civilization as we know it.”

– Jerry McDowell,  
Vice President for Defense  
Systems & Assessments

Sandia’s Defense Systems & Assessments Strategic Management Unit supports the military, assessment, and nonproliferation communities by applying the lab’s engineering, science, and technology capabilities to develop innovative systems solutions for the toughest national security challenges.

### Defense Systems & Assessments has programs in:

#### Remote sensing & verification

Detering proliferation and verifying compliance with international agreements using space-borne and ground-based sensing technology.

#### Space missions

Cultivating satellite and space awareness technologies that meet critical future national security needs.

#### Surveillance & reconnaissance

Advancing U.S. capabilities in radar and other remote sensing technologies for the battlefield and space.



#### Proliferation assessment

Contributing to our customers’ assessments of threats to our nation’s security from weapons of mass destruction worldwide.

#### Information operations

Ensuring security of critical military, government, and commercial networks using trusted systems to detect anomalies and intrusions by sophisticated U.S. adversaries.

#### Integrated military systems

Supporting the nation’s needs for reentry, aerospace precision guidance, target acquisition and defeat technologies, directed energy, and intelligent transformational systems.



## DID YOU KNOW?

*The military has deployed synthetic aperture radar (SAR) systems developed at Sandia that use computational techniques to see through clouds, smoke, fog, dust, and heavy rain. Their ever-smaller size allows SARs to be flown on unmanned aerial vehicles (UAVs).*

### Special operations

Meeting the immediate and long-term technology needs of U.S. special operations forces.

### Science & technology products

Providing differentiating research, innovation, and products, including microsystems and electronics technologies that provide the war fighter with new capabilities.



### Strategic alliances

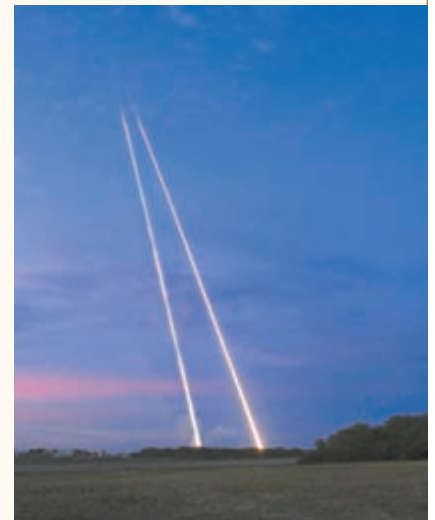
Amplifying Sandia's value to the nation and national security by partnering with the DoD industrial base.

## ACCOMPLISHMENTS

► A joint Sandia/Los Alamos National Laboratory team developed, delivered, and helped launch several satellite payloads supporting the nation's capability to monitor nuclear explosions from space, including the DSP-23 payload, two payloads on GPS IIR satellites, and three payloads for GPS IIF.

► Sandia coordinated nine launches from the Kauai Test Facility in 2007 as part of its role in providing missile targets to test U.S. missile defense systems. In November, in support of the U.S.

Navy's AEGIS Ballistic Missile Defense System, Sandia launched two ballistic missile targets simultaneously; both were successfully intercepted.



Dual launch at the Kauai Test Facility

A Sandia antenna field in New Mexico tracks GPS satellites carrying U.S. Nuclear Detection System sensors.



*We seek improved world stability through technology and global engagement.*



## ENERGY, RESOURCES, & NONPROLIFERATION

# Securing a stable, peaceful, and free world



“Today, like at no other time in our past, national security must be considered in a global context. Energy has become a worldwide commodity, inextricably linked with water, resources, climate change, nonproliferation and nuclear terrorism, as well as social, political, regulatory, and economic issues that affect our nation’s interactions with other countries.”

— Les Shephard,

*Vice President for Energy, Resources, & Nonproliferation*

Sandia’s Energy, Resources, and Nonproliferation Strategic Management Unit helps the nation ensure the security and availability of energy supplies, water, and other critical resources and the control of proliferant materials worldwide. These issues, with their strong global inter-dependencies, have become increasingly important to both national security and global stability.

### Energy, Resources, & Nonproliferation has programs in:

#### Fuel & water systems

Providing solutions that ensure secure and sustainable supplies of resources, safe and resilient fuel and water delivery infrastructures, and clean and efficient use of resources.

#### Nuclear energy

Helping renew U.S. leadership in nuclear energy through capabilities in waste disposal science, nonproliferation, plant safety and security, transportation safety

and security, and integrated systems modeling and demonstration.

#### Global security

Reducing proliferation and terrorism threats to U.S. security by creating sustainable solutions through international cooperative threat reduction programs for nuclear, radiological, biological, and chemical weapons and materials.





## DID YOU KNOW?

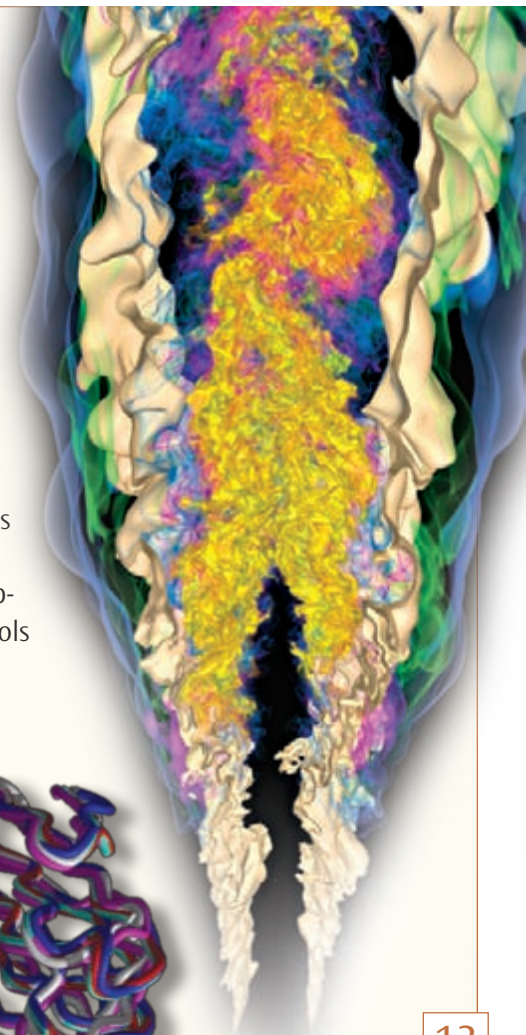
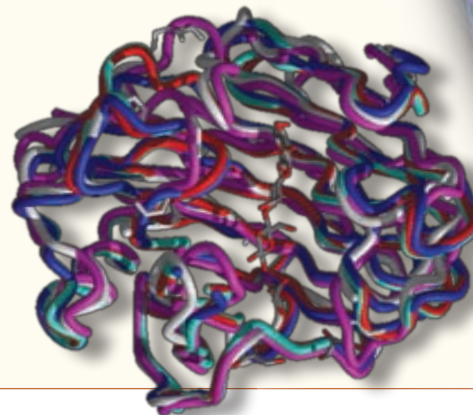
*DOE's Energy Information Administration estimates that total U.S. energy consumption will increase 19 percent by the year 2030. Of all sources, energy production from coal, biomass, and wind is expected to increase the most during that time.*

## ACCOMPLISHMENTS

► Sandia helped establish the Joint BioEnergy Institute (JBEI), a partnership among six institutions including Sandia. Funded by DOE's Office of Science, this \$135 million, five-year program will address the challenges to efficiently producing cellulosic ethanol biofuels for cars and trucks.



► Sandia research contributed to the first all-computationally designed diesel engine made by Cummins Inc. Through advanced laser-based optical diagnostics, Sandia's Combustion Research Facility helped formulate the first firm scientific understanding of the complex combustion processes inside a diesel engine and provided guidance for development of the computational tools used by Cummins.



*We make enduring contributions to secure our society against high consequence terrorist threats and national incidents through effective use of science, technology, and systems solutions.*



## HOMELAND SECURITY & DEFENSE

# Protecting society from harm

“Each day brings new threats to America – a shoe-bomber today, a liquid explosive or a hurricane tomorrow. We must be nimble in responding to these immediate threats while ensuring we bring long-term, fundamental technology solutions to bear on our nation’s security.”

– Paul Hommert,  
*Vice President for  
Homeland Security & Defense*

Sandia’s Homeland Security & Defense Strategic Management Unit applies innovative, science-based systems engineering solutions to protect military bases and U.S. government assets, wherever they are, and public and civilian asset on U.S. soil.

We explore solutions across the threat spectrum – from anticipating and preventing threats to U.S. assets to responding and recovering from incidents. Our work includes threats posed by weapons of mass destruction

and disruption, intruders, and high-consequence natural disasters.

Sandia’s unique homeland security capabilities are derived from the Lab’s nuclear weapons and national security heritage.

We address the broad challenges of homeland security by striving to provide enduring foundational solutions that transcend agencies and customers.

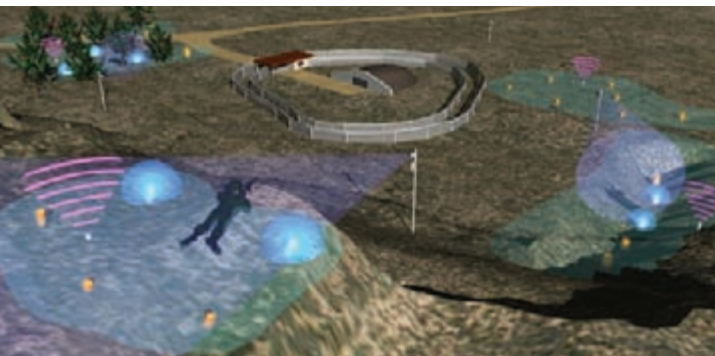






## DID YOU KNOW?

*Sandia's SNIFFER, a rapidly deployable chemical sensor designed to warn of attack by chemical warfare agents at high-profile events, was deployed at the 2008 Super Bowl and 2008 Rose Bowl.*

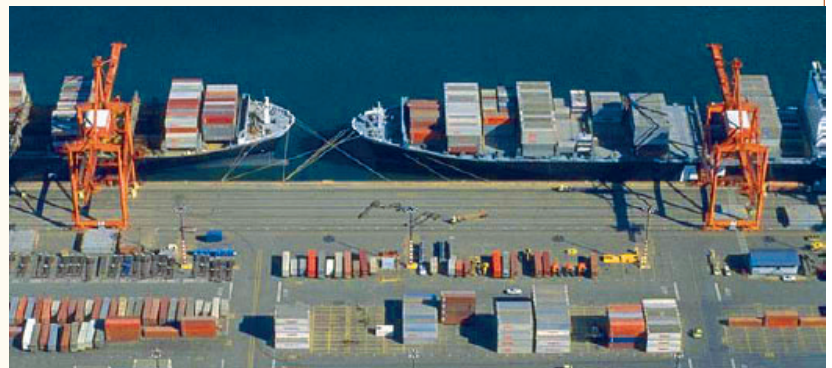


(BIRC) at Sandia to provide scientific modeling support to decision makers responding to the detection of a biological agent at an indoor facility. The Center incorporates aspects of Sandia's Building Restoration Operations Optimization Model (BROOM) to enable interpretation of post-event sampling data.

## ACCOMPLISHMENTS

► Sandia installed a Virtual Presence Extended Defense (VPED) pilot system in a heavily wooded area around a U.S. Navy installation, demonstrating extended security beyond the site's traditional perimeter. In tests the system has exceeded expectations for detection probabilities, adapting to the environment, and minimizing nuisance alarm rates.

► The U.S. Department of Homeland Security has established the BioWatch Indoor Reachback Center



► Researchers at the National Infrastructure Simulation and Analysis Center (NISAC), located at Sandia, completed a study to map and model effects of an influenza pandemic on U.S. critical infrastructures, including understanding infrastructure interdependencies across and within sectors. The study helped the Department of Homeland Security anticipate national challenges during a pandemic.

*We enable Sandia's mission through a capable research staff working at the forefront of innovation.*



## SCIENCE, TECHNOLOGY, & ENGINEERING

# Securing the future through discovery and innovation



“We must have fabulous science, and we have got to make sure we can connect that science to Sandia’s mission so that our results can make a difference.”

– Rick Stulen,  
*Vice President for Science,  
Technology, & Engineering*

To ensure that Sandia’s fundamental science and engineering base remains vibrant and relevant, Sandia’s Science, Technology, & Engineering Strategic Management Unit ensures that its researchers are among the most capable in the world and that their work takes place at the forefront of human knowledge. We view recognition by and engagement with the broader academic and industrial communities as a necessary part of our work.

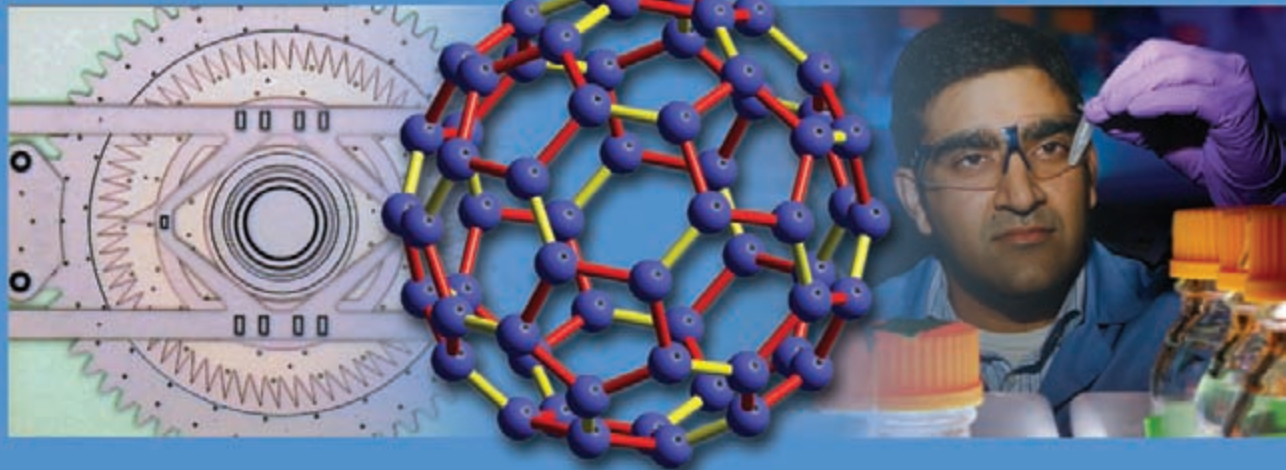
To enable Sandia’s mission, we define and pursue those fields in which

we must be a world leader if Sandia is to meet future national security needs. We focus on areas where scientific and technical solutions transcend and support most or all of Sandia’s business units.

The Laboratory Directed Research and Development (LDRD) program provides Sandia the flexibility to invest in discretionary R&D that stretches the Lab’s capabilities and supports its missions. The program promotes innovative research by funding projects that are short term, often high risk, and potentially high payoff, attracting exceptional research talent from across many disciplines.

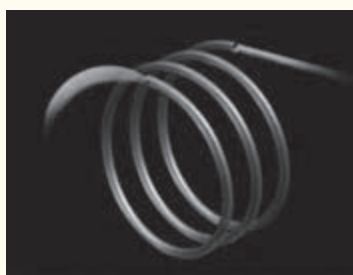


Novint Falcon 3-D Touch Controller



## DID YOU KNOW?

*Sandia researchers have published more than 4,000 peer-reviewed papers since 2002, nearly 80 percent of which represent collaborative efforts with DOE laboratory, university, and industrial partners.*



In 2007 Sandia researchers and their collaborators received five R&D 100 Awards, which are presented by *R&D* magazine in recognition of the 100 most technologically significant products introduced into

the marketplace that year. Sandia has accumulated 80 R&D 100 Awards since 1976.

***Self-Assembling Process for Fabricating Tailored Thin Films***, a simple, economical nanotechnology coating process that enables development of nanoparticle thin films with architectures and properties unattainable by other processing methods.

***ElectroNeedle™ Biomedical Sensor Array***, a device that, when pressed against the skin, can make rapid diagnostic measurements in a point-of-care setting, such as a hospital.

### The 2007 R&D 100 Awards were:

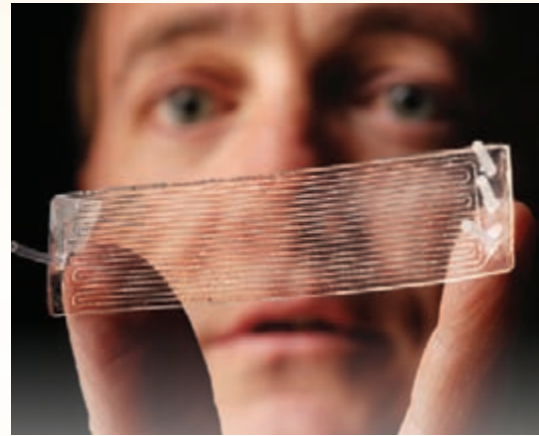
***ArcSafe® with Pulsed Arrested Spark Discharge***, a patented electrical wiring diagnostic tool effective in detecting and locating wiring insulation defects in aging commercial aircraft.

***Mode-Filtered Fiber Amplifier***, a breakthrough technology that enables fabrication of practical, high-power, high-beam-quality laser sources that are compact, rugged, and extremely efficient.

***Novint Falcon and Novint/Sandia 3D-Touch Software*** (joint award), the first controller that makes high-fidelity interactive three-dimensional touch possible and practical for consumer computing applications.



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*Exceptional service in the  
national interest*



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