

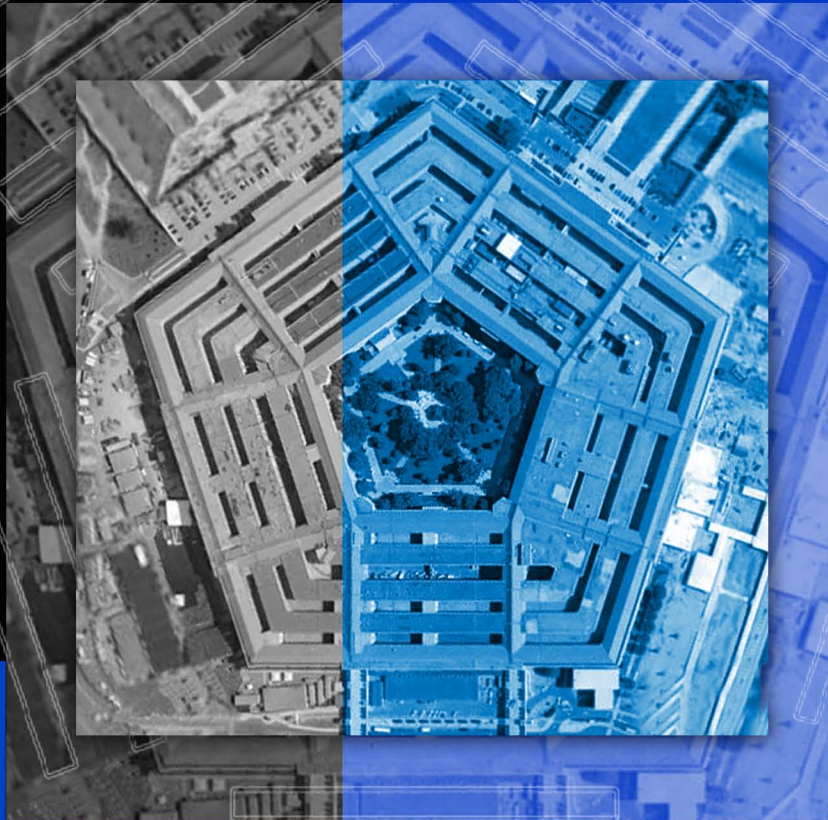
HOMELAND DEFENSE

Vision:

Making an enduring difference in securing our society against high consequence terrorist threats and national incidents through effective use of science, technology, and system solutions.

FORCE PROTECTION

Safeguarding the nation through analysis, technology and innovation.



POINT OF IMPACT
INITIAL IMPACT AREA

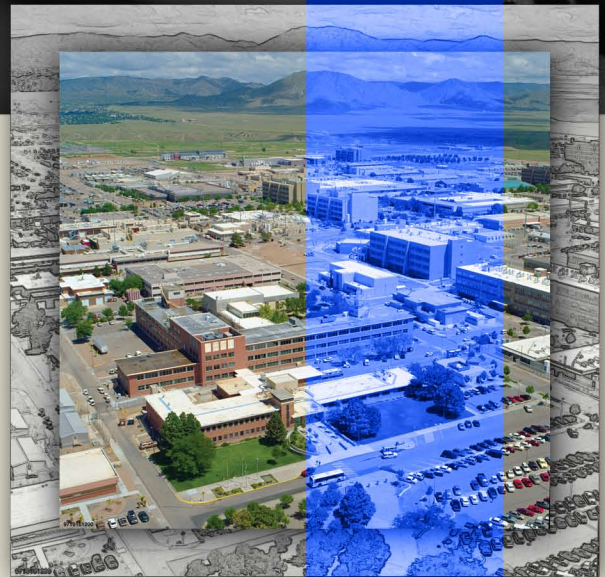
At Sandia National Laboratories, we explore solutions throughout the entire threat spectrum. Detecting threats—before they occur or in the early stages—is essential to preventing an attack or mitigating intended harm. Sandia's multi-disciplinary teams develop not only technologies but also system solutions tailored to the unique challenges arising from malevolent threats.

Exceptional Service in the National Interest



Homeland Defense & Force Protection THE SANDIA ADVANTAGE

Evolving adversary threats are manifest in today's world. At Sandia National Laboratories, our unmatched assets in security and defense—acquired from safeguarding the U.S. nuclear stockpile—are fundamental to homeland defense and force protection. Our core capabilities for Homeland Defense and Force Protection derive from a long-standing science and technology base and unique facilities largely provided by the U.S. Department of Energy. As a national security laboratory, we couple our systems engineering expertise with investments in science and technology to meet national security needs.



Integrated Approach

Our challenge? To anticipate and mitigate unprecedented risks, and to rapidly respond to and to recover from catastrophic events—both natural disaster and acts of terrorism. We have integrated the following strengths to address the complexity of this challenge:

- **Expertise and Facilities**—Blending our multidisciplinary staff and laboratory resources continuously advances science, while developing systems and technologies. Our expertise and resources address systems analysis; systems engineering and integration; modeling and simulation; threat and risk assessment; and detection, diagnostics, and countermeasures.
- **Systems Approach**—Addressing the full threat spectrum, we analyze complex problems as systems, then design methods and technologies for all aspects. We conduct research and systems analysis, then design systems and components, and finally test and integrate these systems. We explore solutions designed to anticipate, prevent, protect, respond to, and recover from evolving threats. Our approach contributes to robust, cost-effective results.
- **Partnerships**—We work with industry, academia, other national laboratories, and with end-users to discover solutions that protect critical assets. Through partnerships, we rapidly develop solutions to urgent problems.
- **Real-World Focus**—For more than 50 years, Sandia scientists and engineers have delivered real-world products that are effective within real-world constraints. We consider cost, schedule, vulnerabilities, level of protection, robustness, acceptable risk, and consequences. We design for manufacturability and for operational end products.

ADVANTAGE

Sandia provides an unbiased, unique, science-based, systems engineering approach toward complex force protection and homeland defense issues.

Homeland Defense & Force Protection

SANDIA CAPABILITIES

At Sandia National Laboratories, our capabilities belong to the nation. We have applied and adapted 50 years of stockpile-security research and development to meet the complex challenges of the 21st century. We have developed methods and technologies to reduce vulnerabilities—of assets, missions, infrastructure and installations—to terrorism and natural disaster. And Sandia's ongoing Laboratory-Directed Research and Development underwrites and enables new capabilities in Homeland Defense and Force Protection. Our world-class strengths align Sandia to anticipate, detect, protect, and mitigate four broad types of emerging threats: (1) intruders (who attack cyber and physical spaces), (2) chemical and biological agents, (3) radiological/nuclear, and (4) explosives, as well as the threat of Mother Nature.

Of particular relevance to Homeland Defense and Force Protection are Sandia's resources that address physical security, energy surety, critical infrastructure and modeling, along with information/cyber operations. Our risk assessment capabilities enable decision-makers to prioritize threats and responses.



The following core facilities support Sandia's work in Homeland Defense and Force Protection:

- Intrusion detection and denial test facilities,
- Chemical detection laboratory,
- Explosive and ballistic test complex and explosives applications test facilities,
- Cyber intrusion-detection systems specialized laboratory and test bed,
- Technical Evaluation and Assessment Monitoring Site,
- High-performance computational and visualization facilities,
- Sensitive Compartmented Information Facilities (SCIF), and
- Microsystems and Engineering Sciences Applications (MESA) complex.

In addition, decades of research has enabled Sandia to:

- Develop system solutions,
- Develop and design advanced prototypes for specialized applications,
- Consult with government agencies on how to create better protection systems,
- Characterize threats, and
- Test and evaluate detection and protection systems.

We have developed methods and technologies to reduce vulnerabilities—of assets, missions, infrastructure and installations—to terrorism and natural disaster.



THE INTRUDER THREAT

Sandia sets the pace for system design that prevents, detects, and delays potential intruders. Our systems that help provide physical and cyber security include:

- System Effectiveness Analysis,
- Modeling and Simulation of adversary tactics and system vulnerabilities,
- Perimeter Intrusion Detection and Assessments (PIDAS),
- Integrated surety,
- Systems that delay and deny access, and
- Information operations assessments and Red Teaming.

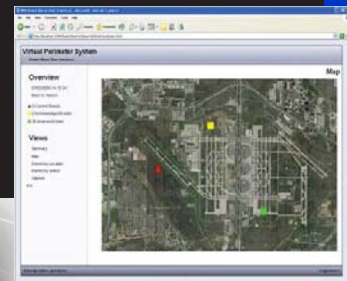


Physical Security

Detecting intruders early is essential to increase the probability of sufficient time to assess personnel and vehicular threats and deploy responders in time to thwart the attack. For over 50 years, Sandia's physical security systems have been integrating a systems-engineering approach with technology development to defend and protect high-consequence assets. Sandia works with many government partners to understand new and evolving threats and expertise provide a seamless, phased-security approach to address specific vulnerabilities.

Sandia's security-systems capabilities includes:

- Risk assessment methodologies,
- Intrusion detection, including Virtual Presence and Extended Defenses (VPED),
- Vulnerability assessment modeling and simulation,
- Active response & denial,
- Critical information systems,
- Contraband detection,
- Transportation assessment,
- Security analysis & methodology training, and
- Mobile robotics and intelligent systems control.



Above: VPED stand-alone user interface.
Left: Radiation detectors interrogate passing vehicles

Cyber Security

To safeguard customers' cyber assets, Sandia tools identify and correct vulnerabilities in existing systems, as well as detect and contain threats. Our next-generation cyber-security tools counter new online threats. And our Red Team experts conduct dynamic systems analysis—from the adversary's perspective—to independently assess how weaknesses might be exploited. This flexible methodology examines both current and dynamic threats. It generates measurable, reproducible, and actionable results. Resulting blueprints then bolster security and mitigate damage. (Also see *Protecting Military Base Infrastructure*.)



ANTICIPATE → PREVENT → PROTECT → RESPOND → RECOVER

CHEMICAL AND BIOLOGICAL THREATS

Given the complexity and range of possible chemical and biological threats, developing the best preparation and response strategies is a difficult process that must be based on sound science and analysis.

Drawing on experience dating back to the deadly 1995 sarin attacks in the Japanese subway, Sandia's Chemical and Biological National Security Program blends foundational chemistry and bioscience with extensive national security expertise to help the nation strategically defend against chemical and biological threats.

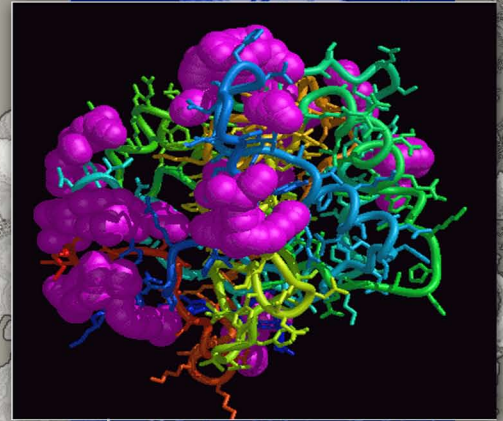
Our work provides insights on how attacks might occur, as well as technology-based systems for detecting, responding to, and recovering from events. As a result of these activities, we've developed and demonstrated high-impact solutions that today enhance our nation's security.

Chemical and Biological National Security Program

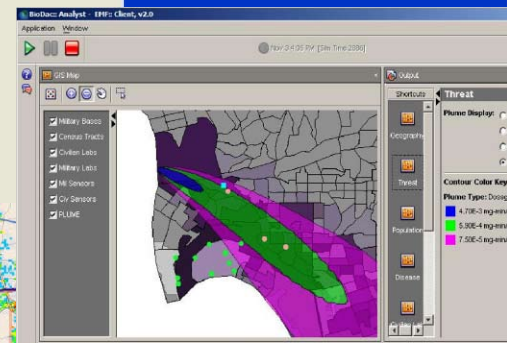
The objectives of this Program are to protect the nation's population, missions and critical infrastructure from, as well as mitigate the consequences of, chemical and biological attacks.

The Chem/Bio National Security Program draws on diverse Sandia capabilities:

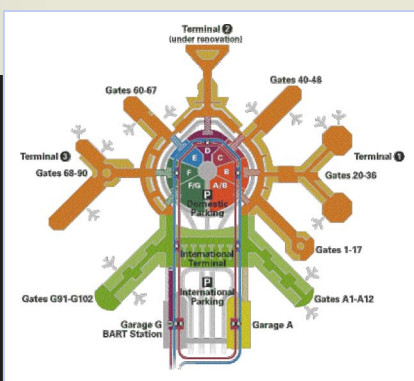
- Systems analysis informs decisions, sets priorities, establishes requirements
- Rapid, accurate agent Detection and detection systems
- Forensics and attribution
- Biological countermeasures
- Biomedical R&D, characterizing biothreats and developing next generation assays
- Decontamination & restoration provides technologies and systems for rapid recovery
- Large system demonstrations and deployments



Identification and assessment of robust proteomic signatures



Biodefense system requirements and configurations



Venue Protection: PROTECT/
PROACT/etc

Standoff biodetection



ANTICIPATE → MITIGATE → RESPOND → RECOVER

THE THREAT OF EXPLOSIVES

America needs agile, aggressive technologies to anticipate, deter, and thwart explosives attacks. Patented sample collection and preconcentration technology at Sandia National Laboratories has advanced trace-explosives detection. We have designed, tested, and licensed screening technologies and countermeasures to prevent, detect, and mitigate attacks. Small, fast, affordable systems detect explosives vapor and particles from sub-fingerprint amounts of residue.

Our explosives work engages in the research, design, development, manufacture and testing of explosive components, explosive systems, and critical asset mitigation systems. Sandia is engaged in a broad spectrum of explosives applications including design and development of explosive-shaped charges and conventional warheads, the development of specialized detonator firing systems, modeling and testing of blast phenomena and their effects, and unique energetic devices for specialty applications. Sandia is also the world leader in understanding explosive dispersal of CBR (Chem, Bio, Rad) agents.

The Explosives Applications team capabilities include:

- Ballistics modeling and simulation capabilities,
- Rapid prototyping for support of device design and testing activities, and
- Design and fielding of both lethal and non-lethal energetic systems.
- Rapid response team training for mitigating improvised devices and 24-7 response staff availability.

Explosive Test Facilities include:

- Explosive & Ballistic Effects Laboratory,
- Rapid Response Explosives Laboratory,
- Containment & High-Consequence Assessment Technology Laboratory,
- Explosive Components Facility,
- Light-Initiated High Explosive (LIHE) Facility,
- 10,000-pound explosive-limit burn site, and
- 12-acre training venue, including a transportainer stack, a sewer, and multiple vehicles.



The MicroHound™ provides a fast, portable, lightweight, low-cost solution for trace detection of common high explosives.

Sandia is engaged in a broad spectrum of explosives activities.



Above: Ballistics Test Area.

Left: Explosively formed projectile (EFP) penetration of Rolled Homogenous Armor target.



Explosives Applications Laboratory.

PROTECTING MILITARY BASE INFRASTRUCTURE

To safeguard military base infrastructure—including energy, communications, and water supply—Sandia National Laboratories offers expertise as well as national, regional, and local, analysis tools and databases. Our integrated assessment and mitigation of vulnerabilities—plus the ability to customize our work—enhances a military installation’s response to potential and real infrastructure threats.

Military Base Infrastructure Security

Sandia offers the following benefits:

- Providing vulnerability and consequence analysis to help the U.S. Department of Defense understand interdependencies,
- Developing countermeasures to mitigate risks associated with vulnerabilities.
- Tailoring our efforts to support particular installations, and
- Offering cost-effective solutions.

MBIS Risk Model. The Military Base Infrastructure Security (MBIS) risk model provides a framework to deter, mitigate, or neutralize potential threats. Tools allow in-depth treatment of entire systems. Sandia provides a complete analysis and solution for any control system based on the risk level that the system owner accepts.

Critical Infrastructure Modeling. Sandia’s experts have developed a dynamic understanding of critical infrastructures, their interdependencies and behaviors under all conditions, and the full spectrum of consequences of disruptions. Sandia has a wide range of modeling capabilities that can be used alone or in including:

- Stock-and-flow, process-based system dynamics models,
- Mathematical network-optimization models,
- Complex adaptive networks, and
- High-fidelity, agent-based simulations of systems of individual elements as well as their performance and behaviors.

Microgrid System. Sandia has partnered with the U.S. Army Construction Engineering Research Laboratory to implement the Energy Surety Microgrid on military facilities. The Microgrid is the only methodology that links mission capability to infrastructure reliability and availability. It operates when the traditional grid is down by:

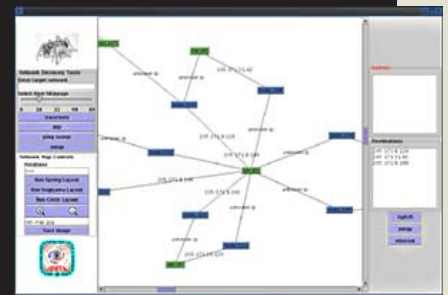
- Increasing energy reliability and framing it within Base Commander’s mission context,
- Improving security of power supply,
- Reducing dependence on fossil fuels – permitting integration of renewables into power-supply infrastructure, and
- Enhancing mission readiness.

Information & Cyber Security

Sandia’s Center for Control System Security specializes in the research, development, and analysis of control-system security. With increased threat levels against critical infrastructures and associated control systems, Sandia’s ability to develop, implement, and analyze security solutions for these systems within the context of an entire critical infrastructure has become extremely important to military bases as well as to civilian cyber systems



We consider the full-threat spectrum surrounding interdependencies and vulnerabilities.



Cluster nodes gather data from sensor nodes and use cameras to survey the area.



Homeland Defense & Force Protection
SANDIA DELIVERS

Sandia provides an unbiased, unique, science based, systems engineering approach toward complex force protection and homeland defense issues.



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Homeland Defense and Force Protection

Why Are People Seeking Sandia's Help?

Our customers are most interested in our science-based, systems engineering approach to complex problems because we focus on understanding and assessing threats, issues, vulnerabilities, and solution space to create effective, optimal solutions.

They value our work because it is centered on our Science and Technology focus, Intelligence insight, Analysis and Engineering tools, Test and Evaluation Infrastructure, systems-level design (enabled by high-performance computing), rapid prototyping capability (enabled by MESA), and a broad customer base enabling us to leverage efforts.



Microsystems Engineering for Strategic Applications (MESA)

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