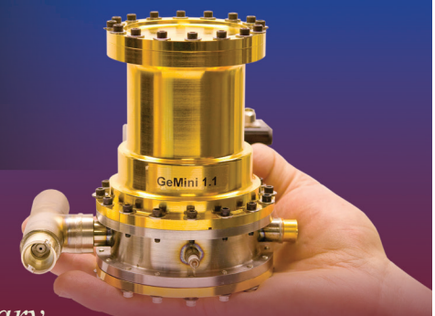
Lawrence Livermore National Laboratory



Global Security

The Global Security Principal Directorate applies multidisciplinary science, engineering and analysis to understand threats to national security and global stability and to devise system solutions to counter those threats.

In today's increasingly interconnected world, national security is not a single-nation issue but must be addressed within a global context. The United States faces challenges from new adversaries and old—the threat of asymmetric warfare and rogue states armed with weapons of mass destruction and, simultaneously, the possible resurgence of Cold War-era hostilities. American dependence on foreign oil, much of it imported from regions with strained relations with the United States, poses a security risk, particularly in light of the world's escalating demand for energy. The effects of global warming and climate change, driven in large part by the burning of fossil fuels, portend massive economic upheavals and population shifts. Drawing upon multi-disciplinary capabilities in science and engineering, researchers at Lawrence Livermore National Laboratory (LLNL) devise technical solutions to help the U.S. meet these and other challenges to national security and global stability.

Energy and Environmental Security

The nation's security and prosperity, and indeed that of the world, depend on the availability of abundant, affordable energy resources that do not adversely impact the environment. LLNL scientists develop technologies, such as underground coal gasification and carbon capture and sequestration, to enable the utilization of the country's vast reserves of fossil fuels while safely eliminating carbon dioxide emissions. They also develop innovations to "decarbonize" the electrical grid and transportation system, expand the use of renewable energy sources and make nuclear power cost-competitive and proliferation-resistant. The Laboratory is a recognized world leader in fusion energy research and climate science and assessments to understand the processes that drive climate change, including the effects of human activities. In addition, researchers develop technologies and procedures for comprehensive observation systems to measure carbon emissions and verify the effectiveness of mitigation measures.

Defense

LLNL has a long history of collaborating with the Department of Defense to develop technologies that enhance the U.S. military's agility, survivability and lethality. Laboratory scientists and engineers have expertise relevant to missile defense, directed-energy weapons, and advanced conventional weapons, munitions and armor. LLNL also helps meet defense needs in information technology, providing conflict modeling tools like the Joint Conflict and Tactical Simulation (JCATS), which is used around the world for warfare training, planning and rehearsal, as well as state-of-the-art technologies for remote and covert sensors, data fusion and secure communication. Other programs focus on nontraditional battlefield technologies, such as speed-of-light and low-collateral-effect weapons, detection and defeat of improvised explosive devices, and global and space situational awareness.

LLNL researchers develop advanced technologies for rapidly detecting radiological materials and discriminating nuclear threats from innocuous materials.

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Global Security

For more than 30 years, the National Atmospheric Release Advisory Center (NARAC) has been predicting the spread of hazardous materials that have been released, intentionally or accidentally, into the atmosphere.

Intelligence

The Laboratory works at the intersection of science and technology and intelligence analysis to provide the federal government with technically informed insights into the threats, motivations, intentions and capabilities of various foreign entities that challenge the nation's security. These analytical efforts aim to discover early indications and fully characterize threats arising from the proliferation of conventional, nuclear, chemical and biological weapons, as well as missile delivery systems and potential malicious uses of advances in science and technology. LLNL analysts are often called upon to provide expertise on technical and country-specific issues of current concern and contribute to multi-agency intelligence assessments. In addition, research efforts are under way in cyber security, exploitation and analysis of large volumes of data and collection systems innovation.

Counterterrorism

LLNL is a key developer of technical capabilities to protect the U.S. homeland against terrorist attack and potentially catastrophic incidents involving chemical, biological, radiological, nuclear or high-explosive materials. Its threat and risk assessments have helped identify and mitigate critical infrastructure vulnerabilities at federal, state and local levels. LLNL-developed technologies lie at the heart of numerous commercialized instruments and deployed systems for detecting biological, nuclear and explosive materials. The Laboratory is home to the National Atmospheric Release Advisory Center, which provides near-real-time predictions of the spread of toxic airborne releases to help emergency responders deal with such incidents. In addition, LLNL is one of only a few places in the world that can perform forensic analysis of virtually all threat materials, an essential capability for identifying those responsible for an attack.

Nonproliferation

Proliferation has been a concern since the dawn of the nuclear age. The collapse of the Soviet Union, with its vast quantities of nuclear material, added to this threat. More recently, the spread of nuclear weapons technology and the expanding need for civilian nuclear power are severely straining the international nonproliferation regime. Laboratory scientists and engineers are at work around the world to secure at-risk nuclear materials and to promote nonproliferation and counterterrorism through international engagement and collaboration. They also lead major efforts in ground-based nuclear explosion detection, improved technologies for nuclear safeguards, and sensors and systems for identifying and monitoring proliferation-related activities.

A Common Thread

Common to all these programs is the need for global awareness. Knowledge of threats—existing, emerging and future—is essential if the U.S. is to anticipate and respond effectively to events as they unfold. This is true whether the threat is nuclear smuggling, terrorism, a resurgent Russia, energy shortages or climate change. To meet this exceptionally difficult challenge, Livermore researchers develop new technologies for acquiring multifaceted data on a global scale and devise novel techniques for rapidly assessing, integrating and interpreting that data to extract critical knowledge and insights.

For more information, contact the LLNL Public Affairs Office, P.O. Box 808, Mail Stop L-3, Livermore, California 94551 (925-422-4599) or visit our website at www.llnl.gov.

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