



BUILDING A SCIENCE AND TECHNOLOGY LEGACY IN HOMELAND SECURITY

Following September 11, Pacific Northwest National Laboratory (PNNL) was called on to advance technologies to respond to the needs of the nation. Twenty-five years later, PNNL continues to play a critical role in nearly every layer of the country's national security, advancing science and technology (S&T) used across aviation, border security, critical infrastructure, and public safety.



2001–2005

Advancing S&T for National Security

- The first radiation detectors were powered on to detect potential threats by scanning international cargo for radiation sources at U.S. borders.
- Radiation portal monitors were put in place at ports of entry around the country to scan for and detect the presence of nuclear and radiological materials.
- Portable Acoustic Inspection Devices received the 2003 Federal Laboratory Consortium (FLC) award; these examine and inspect containers noninvasively and were developed for use by import/export controllers and U.S. enforcement communities.
- Millimeter-wave (MMW) whole-body scanner was licensed for security applications and introduced for passenger screening at airports; received the 2005 FLC award, adding to its R&D 100 Award and R&D Magazine's Editor's Choice Award as the "Most Promising New Technology."



2006–2010

Enhancing S&T for Threat Detection

- Senate-approved critical homeland security funding for Washington State included \$2M for PNNL to use in critical security detection work in the 300 Area of the Hanford Nuclear Reservation.
- Preventive Radiological/Nuclear Detection for Maritime Environments convened federal, state, county, local, and private law enforcement and first responder agencies in drills to enable proper response to and use of their radiological/nuclear detection equipment.
- Explosives Detection Initiative focused on transformational S&T development in explosives detection, with a focus on aviation security.
- Part of a PNNL-managed project, MIT's Lincoln Laboratory's immersive imaging system was piloted at Logan International Airport, providing unprecedented, high-resolution, 360-degree camera coverage.
- Northwest Regional Technology Center for Homeland Security launched a new partnership model to address homeland security challenges with first responders.
- Interagency Biological Restoration Demonstration Program culminated in a first-of-its-kind regional recovery framework for a biological incident that drove the future National Disaster Recovery Framework.



2011–2015

Envisioning the Future of Response

- PNNL transitioned focus to trace vapor detection research and advanced imaging technology development and began supporting detection standards for radiological, nuclear, chemical, and biological threat detection equipment.
- Responder Technology Alliance partnered PNNL with first responders to envision technology needs years into the future and accelerate development and integration.
- Through the DHS System Assessment and Validation for Emergency Responders program, PNNL coordinated assessment activities designed to evaluate technologies and assist emergency responders in making procurement decisions.
- Risk Reduction and Resource Assessment Model was developed to counter the threat of vehicle-borne improvised explosive devices in operational environments.
- As a supporting laboratory for the National Infrastructure Security Analysis Center, PNNL provided modeling and analysis expertise for natural disasters.
- High-Definition Advanced Imaging Technology prototype delivered a next-generation MMW passenger screening system.
- The Biodetection Technologies for First Responders guide and mobile app summarized commercially available technologies to collect, screen, and identify biological materials.



2016–2020

Advancing Technology for Emerging Threats

- Physical and Cyber Risk Analysis Tool technology received the 2017 FLC award and was licensed to RhinoCorps for integration into a tool to examine cyber and physical security postures.
- StreamWorks received the 2018 R&D 100 award for cutting cyberbreach detection to near real time by detecting emerging patterns of sophisticated cyberattacks in massive data streams.
- ABCD, MLSTONES, and SerialTap suite was licensed to Cynash and received 2018 FLC award; it addresses the need for scalable defense, identification of constantly changing malware, and protecting legacy systems, respectively.
- Acoustic Gunshot Detection technology was licensed to SecurityUSA Services, LLC, and received the 2019 FLC award; it can instantaneously detect a gunshot indoors with a high degree of accuracy.
- Development began on five Control Environment Laboratory Resource platforms to provide a controlled, realistic environment for users to experience and learn how to mitigate the possible effects of a cyber-kinetic attack.
- MMW shoe scanner, a 2020 R&D 100 and 2022 FLC award winner, was licensed to Liberty Defense Holdings, a concealed weapons detection company based in Georgia.
- Rapid Analytics for Disaster Response, which quickly assesses post-disaster damage from hurricanes, floods, tornadoes, wildfires, and earthquakes, won a 2020 R&D award.
- BioFeeds delivered a scalable, flexible, open-source data collection, analysis, and dissemination tool to support biosurveillance operations.
- VitalTag debuted a stick-on sensor that measures and tracks a patient's vital signs to help first responders quickly triage, treat, and transport the injured.
- Resilient Tunnel Plug, a collaboration with ILC Dover and West Virginia University, demonstrated subway tunnel flood protection.



2021–2026

Enabling Fieldable and AI-driven Solutions

- Radiation Portal Monitor Program celebrated 20 years in operation, with over 2,000 RPM systems deployed to ~300 ports of entry.
- Threat Risk and Event Analysis, Detection, and Surveillance established a One Health framework for standardized data integration, AI-enabled analytics, and mission-specific decision support.
- Visual Sample Plan received a 2024 FLC award for delivering defensible sampling plans used in national and global security.
- Real-Time Advanced Imaging Technology received a 2024 R&D 100 award for delivering MMW scanning in a walk-by structure.
- Electrical Grid Resilience and Assessment System received the Gold Medal in the 2024 R&D 100 Awards Special Recognition category of Corporate Social Responsibility for hurricane recovery work in Puerto Rico.
- Airport Risk Assessment Model was awarded the Gold Medal in the 2025 R&D 100 Awards Special Recognition category of Market Disruptor; it determines where and when to allocate airport security resources with the push of a button.
- International Remote Baggage Screening was piloted with several international flights, allowing passengers a secure and seamless entry process into the U.S.
- AI-enabled tools enhanced screening and detection for border security, boosting situational awareness, operational efficiency, and mission readiness at ports of entry.
- VaporID demonstrated real-time fentanyl detection at the Nogales border crossing and received the 2026 FLC award for a partnership with BaySpec Inc. that delivered the technology in a lightweight, portable footprint. The technology previously received a 2019 R&D 100 award and was named 2020 GeekWire Innovation of the Year.
- Guardian Immersive Imaging System was deployed to support security at the Super Bowl LX and FIFA 2026 World Cup matches at two stadiums.



PNNL CONTINUES ADVANCING AI, SENSING, DETECTION, AND NATIONAL SECURITY TECHNOLOGIES TO ADDRESS TODAY'S EVOLVING THREATS.