Armor and Materials Research

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INL engineer Dr. Henry Chu stands next to a piece of experimental armor under evaluation at the laboratory.

Metal armor is believed to have originated in Greece around 1400 B.C. Worn by infantry soldiers, the bronze suits – called Dendra Panoply – were heavy and cumbersome but effective against most weapons at the time. Fast forward 3,000 years, and people around the world continue to improve armor's performance against modern threats.

At Idaho National Laboratory (INL), engineers and materials scientists are designing, validating, and manufacturing unique armor prototypes that increase protection while simultaneously reducing weight and production costs. Over the last 25 years, many of the lab's armor designs have been used around the world to safeguard people, vehicles, and facilities.

For instance, INL manufactures the battle-proven armor for the U.S. Army's Abrams battle tanks. We've designed and validated lightweight, bullet-trapping armor for law enforcement watercraft, outfitted remote weapons systems with large-caliber, ballistic-resistant protection, and hardened critical facilities to defend against explosively formed projectiles (EFP) and shaped-charges threats.

INL's approach to armor design includes materials research, armor development, advanced modeling and simulation, testing, and evaluation. And everything can be done on one secure site, allowing for rapid armor prototypes and limited-run productions. Plus, the lab has an explosives range to test prototypes against explosive charges up to 20,000 pounds of TNT equivalent.

The laboratory's armor and materials research supports federal customers including the departments of Energy, Defense, and Homeland Security, along with leading defense industry providers.

Quick Facts

- INL's scientists work with ceramic, metallic, and composite materials to create custom armor applications.
- INL's research into material bonding and encapsulation has led to patented and licensed armor designs.
- INL's ballistic engineers use ABAQUS/Explicit, LS-DYNA, CTH, ALEGRA, SHAMRC, and ALE-3D to model armor designs.
- INL validates armor against explosive and ballistic threats like rocket-propelled grenades, EFPs, armor piercing, and fragment-simulating projectiles.
- A multi-station 450 KeV flash X-ray imaging system is available to capture and analyze the interaction between penetrators and armor systems.
- Phantom V7 and V12 high-speed cameras capture and record ballistic events up to 1 million frames per second.

For More Information

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