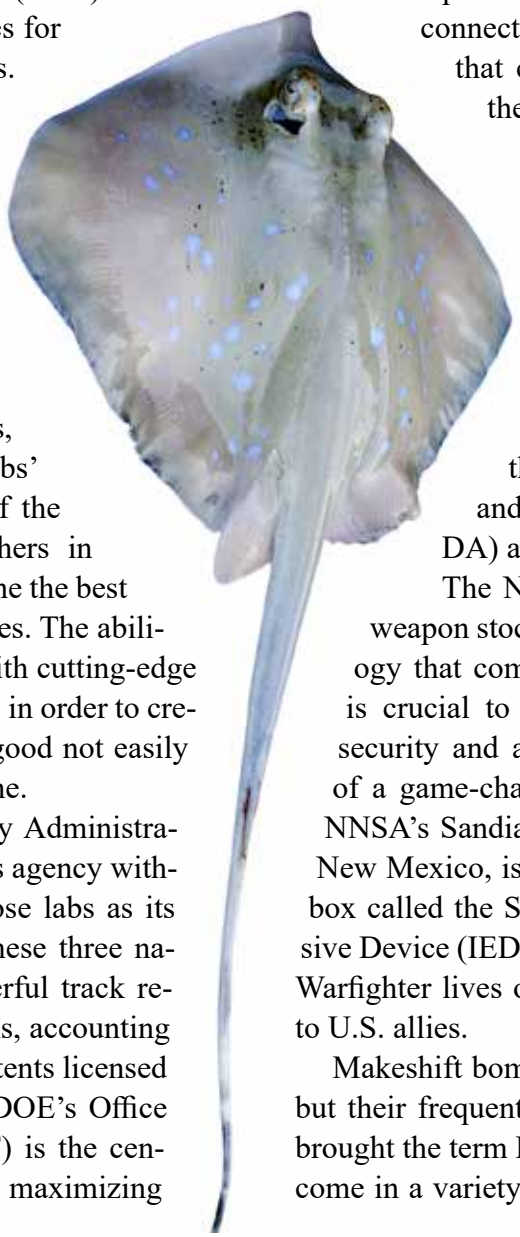
EXPLOSIVE RESULTS

A licensed technology created by Sandia National Laboratories disables IEDs and saves Warfighter lives

The Department of Energy's (DOE) 17 national labs are goldmines for innovative technologies. Inventions from these labs are licensed at a rate nearly nine times higher than the global average for research labs. The applied research they engage in is part of a unique management and operating model that allows the DOE to define precise technological needs, while providing the research labs' scientists—composed of some of the most talented scientific researchers in the world—the liberty to determine the best paths to achieve those technologies. The ability for these labs to experiment with cutting-edge tools and seek inventive solutions in order to create new innovations is a public good not easily fulfilled by the private sector alone.

The National Nuclear Security Administration (NNSA), a semi-autonomous agency within the DOE, utilizes three of those labs as its physics and engineering arm. These three national security labs have a powerful track record for technological innovations, accounting for more than half of the DOE patents licensed to commercial companies. The DOE's Office of Technology Transitions (OTT) is the central hub for technology transfer, maximizing the potential of national lab inventions by connecting them with commercial entities that can help develop and manufacture the technologies. NNSA's Office of Strategic Partnership Programs collaborates with OTT to tackle this work through several strategies including workforce programs, policymaking, training scientists to understand entrepreneurial markets, and identifying funding opportunities through programs that results in Cooperative Research and Development Agreements (CRADA) and licensing agreements.



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The NNSA is highly focused on nuclear weapon stockpile maintenance, but the technology that comes from the NNSA's national labs is crucial to the agency's goals toward global security and aiding foreign allies. One example of a game-changing technology, born out of the NNSA's Sandia National Laboratories (Sandia) in New Mexico, is a powerful tool the size of a shoebox called the Stingray. It is an Improvised Explosive Device (IED) detonator that has saved American Warfighter lives overseas and become indispensable to U.S. allies.

Makeshift bombs have been around for centuries, but their frequent use in 2003, during the Iraq War, brought the term IED into the common lexicon. IEDs come in a variety of forms, used by insurgents, van-

dals and terrorists. Their diverse, improvised nature and their ability to lie hidden on roadsides and in propane tanks and packages is exactly what has made them difficult to address. And so, even well into the conflicts in Iraq and Afghanistan, the technology to disarm these crude explosives remained insufficient and outdated.

In 2006, engineers at Sandia National Laboratories began to develop solutions to the IED technology gap. The idea was to create something that could quickly disable IEDs without injuring people or causing excessive damage to the surrounding area. Sandians Steve Todd and Juan Carlos Jakaboski and contractor Chance Hughs worked with lab engineers to design and develop a fluid-blade disablement tool eventually called the Stingray. In 2010, Sandia licensed the technology to a company called TEAM Technologies, facilitating the production and manufacture of the innovation.

"The Stingray is an energetic tool," said Bob Sachs, CEO of TEAM Technologies. "It uses water as a source to cut through materials. Water is actually a very hard substance—that's why water-jet cutting tools are used in manufacturing. It can be a very effective tool for cutting through objects."

Water has long been used in the industrial world to cut marble and other materials, and that same concept applies to the Stingray. The clear, plastic handheld device has two functions: the water blade and the water slug. The water blade is activated when the Stingray detonates. The resulting explosion sends shockwaves through the water. The force of that explosion, which can result in velocities three times the speed of sound, turns the water into the shape of a blade that can cut precisely through steel and other tough materials. The second capability—the slug—creates a more generalized explosion from the back of the device that allows the force of the water to destroy multiple components of the IED.

The choice to use one function over the other depends on the situation. If it is clear where the wires on an IED are, the water blade can cut through that part of the bomb without damaging other aspects, making it easier to analyze the bomb.

"For instance, in places where we're fighting wars in the Middle East, a lot of IEDs are placed in pressure cookers and five-gallon propane tanks," Sachs said. "Once Warfighters find the bomb, they're able to use this device to bust through it—without the bomb going off. They're then able to do forensics on the bomb to find out what it was made of."

To create these blade-like water configurations for either the blade or the slug, the Stingray uses shaped-charge technology, which is what makes the water a specific shape when exploded—unlike a traditional bomb disruptor that releases energy in a generalized manner of equal distribution. This particular characteristic of the technology is also how it gets its name: It explodes in the shape of what looks like the sharp, venomous barb of a stingray.

The Stingray's introduction to the world led to an Excellence in Technology Transfer Award and was listed as a top invention in TIME magazine for 2010. Within nine months of the technology transfer process, TEAM Technologies sent 5,000 of the portable, durable devices to military personnel in Afghanistan and Iraq.

Even with all its enormous potential, as developed by Sandia, the Stingray was a prototype with nowhere to go. That changed when it was introduced to military trainees at Sandia, who found the technology highly useful and potentially revolutionary. The NNSA tech transfer program worked to find a market for it. When TEAM Technologies heard about the Stingray, it applied for, and received, the license.

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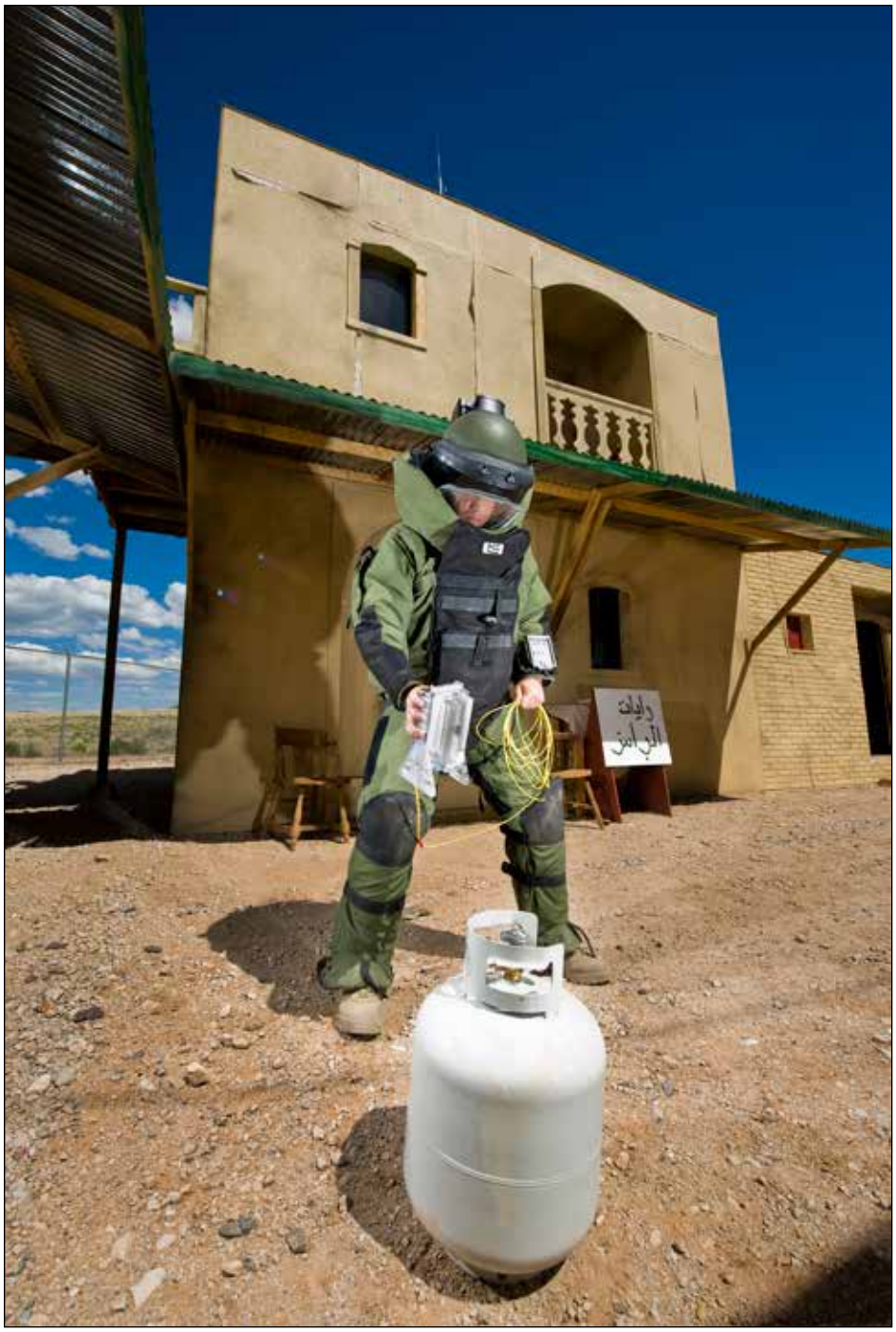

Photo by Randy Montoya

Airman 1st Class Patrick Connolly of Dayton, Ohio, in a training exercise, demonstrates the placement of a Stingray Disruptor, licensed by TEAM Technologies from Sandia National Laboratories. The Stingray's reliability and portability have made it a perfect technology to share with foreign allies in inhospitable environments overseas.

lable, not least because it has saved so many lives. Its reliability and portability have made it a perfect technology to share with foreign allies in inhospitable environments overseas.

"Sandia has now trained thousands of explosive bomb techs on the Stingray Disruptor," said Sandia engineer Robert Todd Miner. "And it is being used in warzones by both our military and our allies all over the world—saving limbs and lives."

The U.S. Department of Defense has also utilized it for homeland security purposes related to terrorism within national borders.

"We do a lot of work across the board in service to defense—it isn't just about nuclear weapons," said Mary Monson, senior manager of Sandia's Technology Partnerships and Business Development. "The technology we develop in the labs here shows great promise for military and homeland security applications. These inventions become invaluable tools to our allies. Something as small as a shoebox can provide important fortification for our overall national—and international—security."