



who attended the demonstration.

Dairy industry representatives are excited about the system's possibilities, and industry input is being considered as adjustments are made in 2009. Scientists have high hopes that if adopted, the possibility of an udder failure in the milk supply chain can be eliminated. •

## A Breakout Year for CIRT

It's official: CIRT is a smash hit.

One of the oldest and best-known science magazines, *Popular Science*, has chosen our concrete-blasting lifesaver, officially called the Controlled Impact Rescue Tool (CIRT), as a "Best of What's New" for 2008.

Funded by S&T and produced by Raytheon, the CIRT helps Search and Rescue Teams rescue people trapped inside collapsed buildings by firing a piston that "smashes through walls like the Kool-Aid Man,"



Firefighters test a CIRT prototype at a Fairfax, Virginia, facility. The device uses a blank ammunition cartridge designed for a standard hunting rifle—driving a piston—that, when fired, generates a high-energy jolt.

S&T Snapshots is a newsletter produced by the DHS Science and Technology Directorate in partnership with the Homeland Security Institute. HSI is a Studies and Analysis Federally Funded Research and Development Center.

To subscribe FREE to S&T Snapshots, view past issues, or forward to a friend, visit us on the Web at:

[www.homelandsecurity.org/snapshots](http://www.homelandsecurity.org/snapshots)

Do you have any thoughts about S&T Snapshots?

Send story tips, questions, and comments straight to our inbox:

[st.snapshots@hq.dhs.gov](mailto:st.snapshots@hq.dhs.gov)

according to a magazine photographer writing in the What's New issue. At a test earlier this year, a CIRT prototype broke through a wall in less than half the time of drills, saws, and jackhammers.

Editors considered thousands of entries this year, and settled on about 100 products in 12 categories. They looked for design quality, ambition, originality, and the significance of the innovation. CIRT broke through in all four categories.

"It looked like a very impressive technology, and it looked like it was head and shoulders over the alternative," said *Popular Science* technology editor Sean Captain, who oversaw the judging process. "We just thought it was a real leap ahead in the (security) category, and something that could save lives."

The CIRT pick follows on the heels of *Time Magazine's* choice to name the LED Incapacitor a best invention of 2007. Awards like these are of great satisfaction, said Jalal Mapar, who manages the project at the Infrastructure and Geophysical Division.

"It's the highest feeling of accomplishment when a prestigious publication picks our tool as one of the innovations of the year," said Mapar. "It makes us feel like we are doing something important."

Currently, the CIRT is still in the testing phase and minor modifications are being made. Discussions about mass production are underway with three major manufacturers. •

# S&T SNAPSHOTS

Science Stories for the Homeland Security Enterprise



U.S. Department of Homeland Security

December 2008 • Volume 2, Issue 6

## SQUID: The long (and sticky) arms of the law

What's possible when a group of scientists are inspired by a famous superhero and a giant creature from the sea? How about a new technology for stopping drivers in their tracks?

Fleeing drivers are a common problem for law enforcement. They just won't stop unless persuaded—persuaded by bullets, barriers, spikes, or snares. Each option is risky business. Shooting up a fugitive's car is one possibility. But what if children or hostages are in it? Lay down barriers, and the driver might swerve into a school bus. Spike his tires, and he might fishtail into a van—if the spikes stop him at all. Existing traps, made from elastic, may halt a Hyundai, but they're no match for a Hummer. In addition, officers put themselves at risk of being run down while setting up the traps.

But what if an officer could lay down a road trap in seconds, then activate it from a nearby hiding place? What if—like sea monsters of ancient lore—the trap could reach up from below to ensnare anything from a MINI Cooper to a Ford Expedition? What if this trap were as small as a spare tire, as light as a tire jack, and cost under a grand?

Thanks to imaginative design and engineering funded by the Small Business Innovation Research (SBIR) Office of the U. S. Department of Homeland Security's Science and Technology Directorate (S&T), such a trap may be stopping brigands by 2010. It's called the **Safe Quick Undercarriage Immobilization Device**, or **SQUID**. When closed, the current prototype resembles a cheese wheel full of holes. When open (deployed), it becomes a mass of tentacles entangling the axles. By stopping the axles instead of the wheels, SQUID may change how fleeing drivers are, quite literally, caught.

The 1.5-foot-wide disc was conceived and developed by Engineering Science Analysis Corporation (ESA) of Tempe, Arizona. S&T's Borders and Maritime Security Division manages the project.

"SQUID was inspired by a sea creature and a superhero," says ESA president Martín Martínez.

## In This Issue

**SQUID: The long (and sticky) arms of the law** ....1  
Taking out roadblock crashers by the axles

**Got Milk Security?** ....3  
Securing a favorite beverage from farm to fridge

**A Breakout Year for CIRT** ....4  
Popular Science magazine picks DHS's super sledgehammer as a best of 2008

Like its oceanic namesake, SQUID ensnares its prey with sticky tendrils. Like Spiderman's webbing, these tendrils



stretch to absorb the kinetic energy of its fleeing target.

Huge amounts of such counterforce are necessary to stop a heavy, swift vehicle: Think *Spiderman II*, where Spidey stretched his webbing for blocks to halt a runaway passenger train. The force nearly killed him. Martínez took a different approach that would have made Spidey proud: Don't fight the Force; just stop the axles from turning. Do that and you can stop (almost) anything with wheels.

Can it really work? Martínez and DHS think so. In the summer of 2008, a SQUID prototype safely stopped a 35-mph pickup truck (see video). That's a good start, but before SQUID can be marketed, law enforcement officers need proof that it has the fiber to stop a 5,000-pound vehicle—about the heft of a Ford F-150 pickup—speeding at 120 miles per hour.

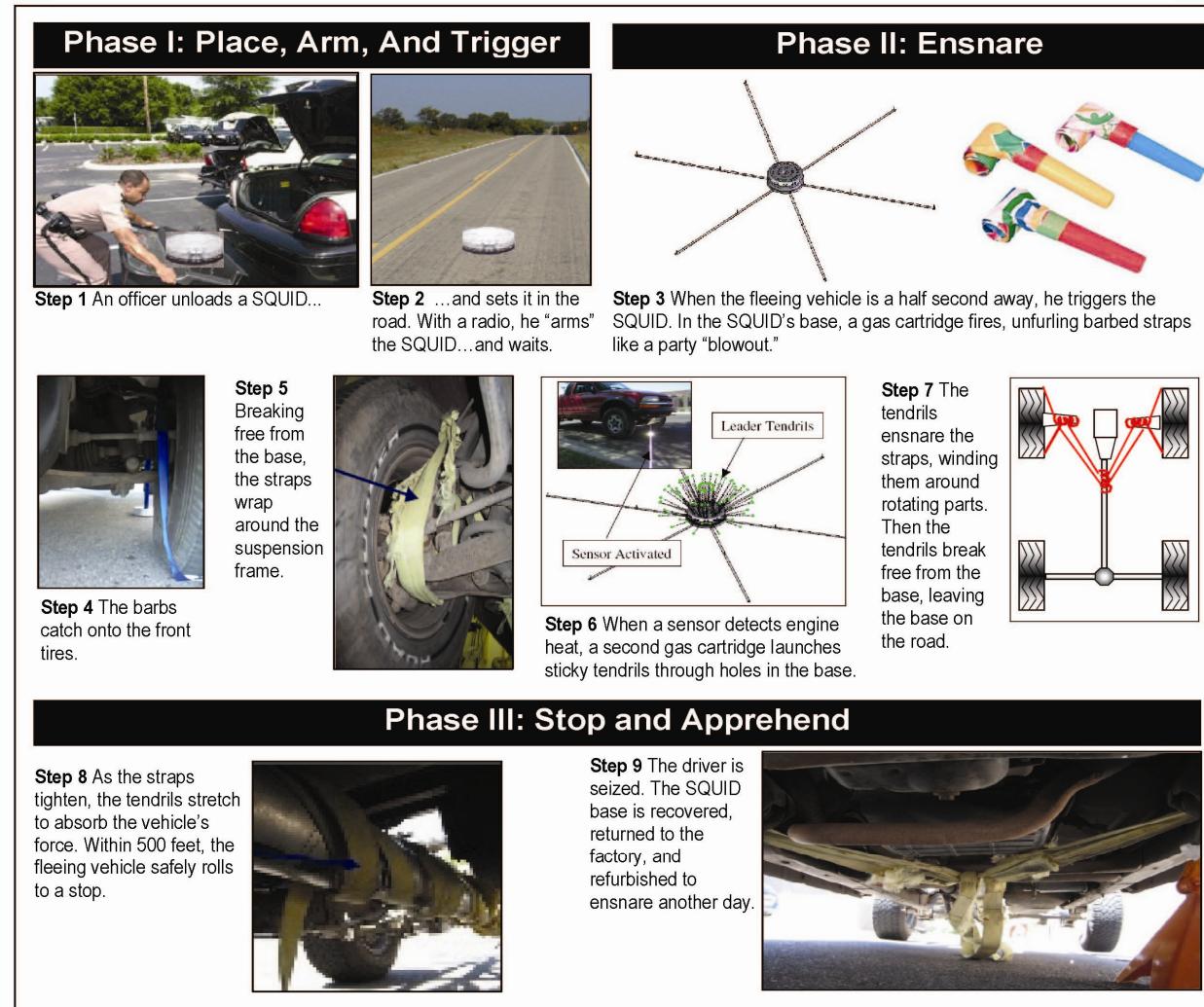
Beyond performance, SQUID will need to satisfy other demands of law enforcement. "We must make it lighter," says Mark Kaczmarek, the S&T SQUID

program manager. "Also, more affordable, so it becomes the stopper of choice, regardless of budget." Finally, SQUID must be rugged, reliable, and capable of being reloaded. These goals will be pursued in 2009, as ESA teams with Pacific Scientific Energetic Materials Corporation (PSEM) of Chandler, Arizona.

Meanwhile, the spidery disc has lured the interest of state and local police as well as federal agencies such as Customs and Border Protection (CBP) and Immigration and Customs Enforcement (ICE). In response to concerns about whether criminals will see the disc, SQUID may be reborn as a centipede—that happens to look like a speed bump.

Martínez and Kaczmarek hope their spidery cephalopod will spawn a generation of offspring—in this case, a family of nonlethal stopping devices for land, sea, and air...all based on the same sticky principle, *less is more*. "If bad guys need 'inspiration' to comply," says a smiling Martínez, "we'll be glad to inspire them." ●

*Move over, Spiderman: In seconds, the sticky-tentacled SQUID can slow a 2.5-ton truck to a safe, controlled stop.*



## Got Milk Security?

If you're in the dairy business, moo-ving milk from the cow to the grocery aisle can keep you up late at night. One worry: the shiny aluminum tanker trucks that carry milk between farms and processing plants.

In 2005, a pair of Stanford researchers simulated the release of *botulinum* toxin at various points in the milk supply chain, including a tanker truck. If undetected, less than one gram of the toxin would, on average, poison 100,000 people, most of which would occur in less than a week, according to their model's calculations. (Early detection can reduce this number significantly.)

With some 15,000 trucks connecting more than 68,000 dairy farm "dots," transporting 180 billion pounds of moo juice around the country each year, the potential for spoiled milk begins well before it arrives at your refrigerator shelf.

For the past two years, researchers and engineers from three Kentucky universities have been working on a comprehensive security solution that, as a bonus, happens to improve efficiency by streamlining the way that milk is picked up and delivered.

In October in Lexington, Kentucky, scientists unveiled the Milk Transport and Traceability Security System to an international audience of more than 100 dairy and liquid food transport industry representatives. DHS Science and Technology Directorate's (S&T) Infrastructure and Geophysical Division provided funds for the project through the Kentucky Critical Infrastructure Protection Program.

Following the events of September 2001, including the attack on the World Trade Center and the anthrax scare, milk supply chain security was tightened to prevent chemical or biological attacks. The current security system primarily relies on a series of plastic seals to lock up tanks. Truckers may not know if a seal is broken accidentally while on a highway, or intentionally by a criminal or terrorist, until they arrive at a destination. The result is either a lost load or lost time and resources spent investigating the source of the break.

The new system works by limiting access to the milk and keeping a close eye on every move of the hauler or truck. A key component of the system is a handheld computer, a bit larger than a Blackberry, that haulers use to input information about milk pick-ups, deliveries, and tanker cleanings while traveling their routes. A monitoring system mounted on the truck—comprised of a GPS unit, electronic locks and key pads, and tank temperature sensors—ensures that only authorized



An electronic lock controls access to the milk tank and keeps track of when it is opened.



milk personnel, like haulers and inspectors, can access the tanker.

As information is entered manually by the hauler or sent automatically by the truck, a separate data server allows supervisors to closely track information from an entire fleet of trucks in near real-time, while cutting down dramatically on paper work and human error, according to Chris Thompson, a University of Kentucky (UK) Regulatory Services milk coordinator.

"This new system is a leap forward in terms of security and efficiency," said Thompson. "Once implemented, consumers should have even more confidence in the safety of the milk and dairy products they consume every day."

The new milk security system is a collaboration of the University of Kentucky, Western Kentucky University, and the University of Louisville.

"We must encourage technology solutions that include industry stakeholders, tap into the research and development capabilities at our universities, and keep security costs low for the end-user," said Kentucky Rep. Hal Rogers, Ranking Member on the House Appropriations Subcommittee for Homeland Security, who