

# DEFENSE TODAY

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## DARPA, Industry Provide Leap Ahead In Night Vision

**U.S. night-vision technology, already very good, is poised to get even better with the advent of short-wave infrared technology that is smaller, lighter and provides better images than systems now available.**

With the new equipment, networked infrared cameras that produce digital images, negating the need for large processing units, can be placed on soldiers' helmets, the goal of a program in the Pentagon's Defense Advanced Research Projects Agency (DARPA). Other applications for short-wave infrared (SWIR) include covert illumination such as flashlights that allow soldiers to see in caves too dark for night-vision goggles and vehicle headlights that that can be seen only by their drivers.

Jeff Paul, a program manager in DARPA's Information Exploitation Office, said the short-wave infrared region contains five to seven times more energy from starlight and the glow of the night sky—even without moonlight—than other spectra.

"A variety of very interesting applications start to come to mind once you have an imager that is providing good, passive imagery in the SWIR spectral region," he said. "We are very, very interested, excited about this technology."

The technical challenge to date has been getting focal-plane arrays with high-enough resolution and circuits that are sensitive enough to "really take advantage of that potential that mother nature is providing to us," he said.

While hand-held starlight scopes were used in Vietnam and U.S. troops long have used night-vision goggles, the new SWIR technology, while small enough to mount on a helmet, creates video-quality, digital imagery that can be fused in real time with other intelligence on a network, Paul said.

That program is known as MANTIS (Multi-Spectral, Adaptive, Networked Tactical Imaging System), a system Paul manages.

"We have some technical challenges, but we're making I think significant progress on this program in terms of getting the sensitivity we need," he said. "We're pushing the state of the art to where that can be achieved, to exploit this digital imagery on a soldier's head."

Paul said MANTIS aims to produce prototypes by the end of fiscal 2006, after which the agency and the military services will look at opportunities for fielding it.

### Sensors Unlimited

One of the companies helping DARPA with MANTIS is Sensors Unlimited, of Princeton, N.J., a SWIR pioneer that has been working on the technology for more than a decade.

BY RON LAURENZO



Marshall Cohen

Marshall Cohen, CEO of Sensors Unlimited, said the MANTIS system uses four cameras, two of which are based on Indium-Gallium-Arsenide, a flexible alloy that allows SWIR imaging. Cohen said that other companies work with the new material, but Sensors Unlimited was the first.

While current thermal cameras are good, they have several drawbacks, Cohen said. They don't work at dawn, dusk and have problems at high noon. Furthermore, it takes a lot of training for soldiers to interpret thermal imagery. Visible cameras, on the other hand, don't work well in the dark. But SWIR technology works day and night with images that are so lifelike they require almost no training to understand, he said.

The tiny size and ease of use—it has been referred to as "point and click" IR imaging—makes it a prime candidate for other applications. With DARPA sponsorship, Cohen said his company developed the world's smallest infrared camera two years ago. That camera is now being test flown on unmanned aerial vehicles, including the Marine Corps' man-portable Dragon Eye.

Cohen said that it is the size of a nine-volt battery, and is a full camera that can be plugged directly into a TV. Its weight is measured in tens of grams.

Additional SWIR advantages over other wavebands is that it can see through glass, smoke, and sees better into silicon and living tissue. The company's InGaAs cameras work at room temperature—most IR cameras need to be cooled—and do away with shutters and other moving parts. Another benefit is that they allow the user to see eye-safe lasers already used for targeting.

### Wider Uses

Other applications for SWIR technology: It could be added to the seekers of laser-guided munitions to cure one drawback to lasers, the inability to see through dust and obscurants like fog; systems for tracking the launch and path of weapons such as rocket-propelled grenades; and 3-D laser-radar imaging for use in automatic target-recognition applications, Cohen said.

"We're in the development phase of a number of fielded systems that we're not allowed to mention by name," he said.

Although a small company, with about 50 employees, Sensors Unlimited is an example of the kind of subcontractor that enables larger companies to go after high-tech systems in niche markets.

"We deal with almost everybody," he said. "We work closely with Raytheon, Northrop Grumman, Lockheed Martin, BAE Systems, General Atomics, General Dynamics. Often they're involved in systems programs that require our technology and we serve as a subcontractor to them."