R-TECH™ NEWSLETTER
The Newsletter of the First Responder Technologies Program

Volume 2 • Issue 9 • September 2009

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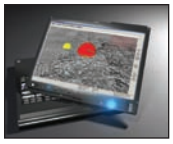

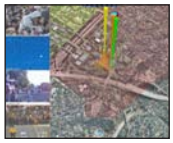

Homeland Security
Science and Technology

This Newsletter discusses technologies of interest to first responders that have received funding, in part, from the Federal government. Mention of these technologies should not be construed as an endorsement of either the technology, or the entity producing it, by the Federal government.

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SECURING THE NATION ONE LEG AT A TIME

Efficiency in Critical Infrastructure Inspection

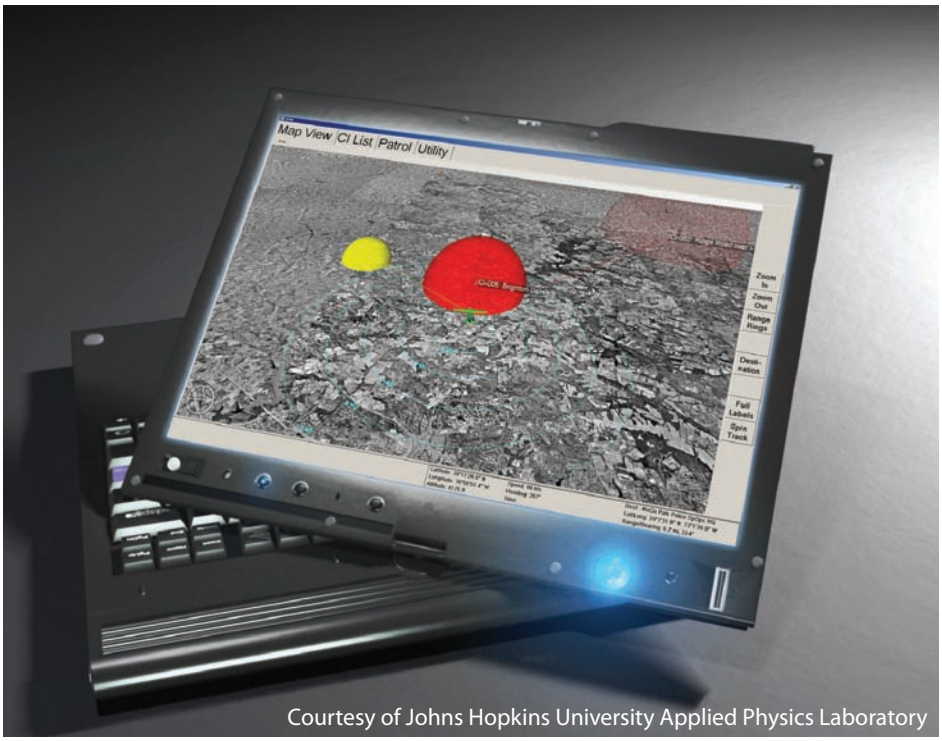
When Maryland State Police helicopters return to base after a law enforcement mission, they don't sit back and enjoy the ride. Sergeant Chad Gainey's troopers at the Maryland State Police Aviation Command spend their return flights inspecting their state's critical infrastructure sites to improve their aerial homeland security mission. The tool that allows the troopers to conduct these inspections is a new technology called the Critical Infrastructure Inspection Management System (CIIMS).

CIIMS enables aerial law enforcement personnel to better protect critical infrastructure and key resources (e.g., dams, bridges, power facilities) through structured monitoring, data collection, and information sharing within the local, state, and federal intelligence communities. CIIMS is a computer-based tool that allows users to file, manage, and prioritize their infrastructure inspections electronically. It consists of a small, easy-to-use, tablet-sized computer with touch-screen controls.

Beyond aiding in data collection efforts and speeding information sharing, CIIMS identifies the locations of critical infrastructure in relation to the location of an inspection team, and has a feature that allows real-time information downloads into a common database. Just before takeoff on the return flight, the flight crew loads a handheld computer tablet with data to create an "electronic flight bag." All of this data is public information, and may include updated photos, coordinates, and maps for each critical infrastructure asset that needs to be inspected.

The tablet is also loaded with questions. While flying over the site, a crew member uses touch-screen controls on the tablet to answer the questions, such as: "Do you see any cracks in the concrete at the base of the bridge? Do you see a yellow truck parked outside the power plant?" The data entered into the tablet is uploaded after the crew lands the helicopter, and is then sent to the authorities that need the infrastructure information.

"The CIIMS project is a significant milestone in strengthening critical infrastructure nationwide, and it represents an important step toward improving information sharing among our nation's emergency responders," said Dr. David Boyd, head of the Command, Control and Interoperability Division (CID) of the Department of Homeland Security Science and Technology Directorate (DHS S&T), which developed CIIMS in partnership with Johns Hopkins University Applied Physics Laboratory and the Maryland State Police in 2007.



Courtesy of Johns Hopkins University Applied Physics Laboratory

CIIMS software is typically loaded on small tablet-sized computers.

The CIIMS project began in Maryland with the Maryland State Police Aviation Command flight crews and aircraft. "We only get dispatched when there is a specific timely mission, so prior to testing CIIMS, we weren't in the air checking critical infrastructure regularly," said Sergeant Gainey. "We didn't know where to store the data and we didn't have specific cues of what to look for. With CIIMS, we can

Securing The Nation (continued)

look for trends because we have eyes on the critical infrastructure more often, and we are able to analyze the data for trending as well."

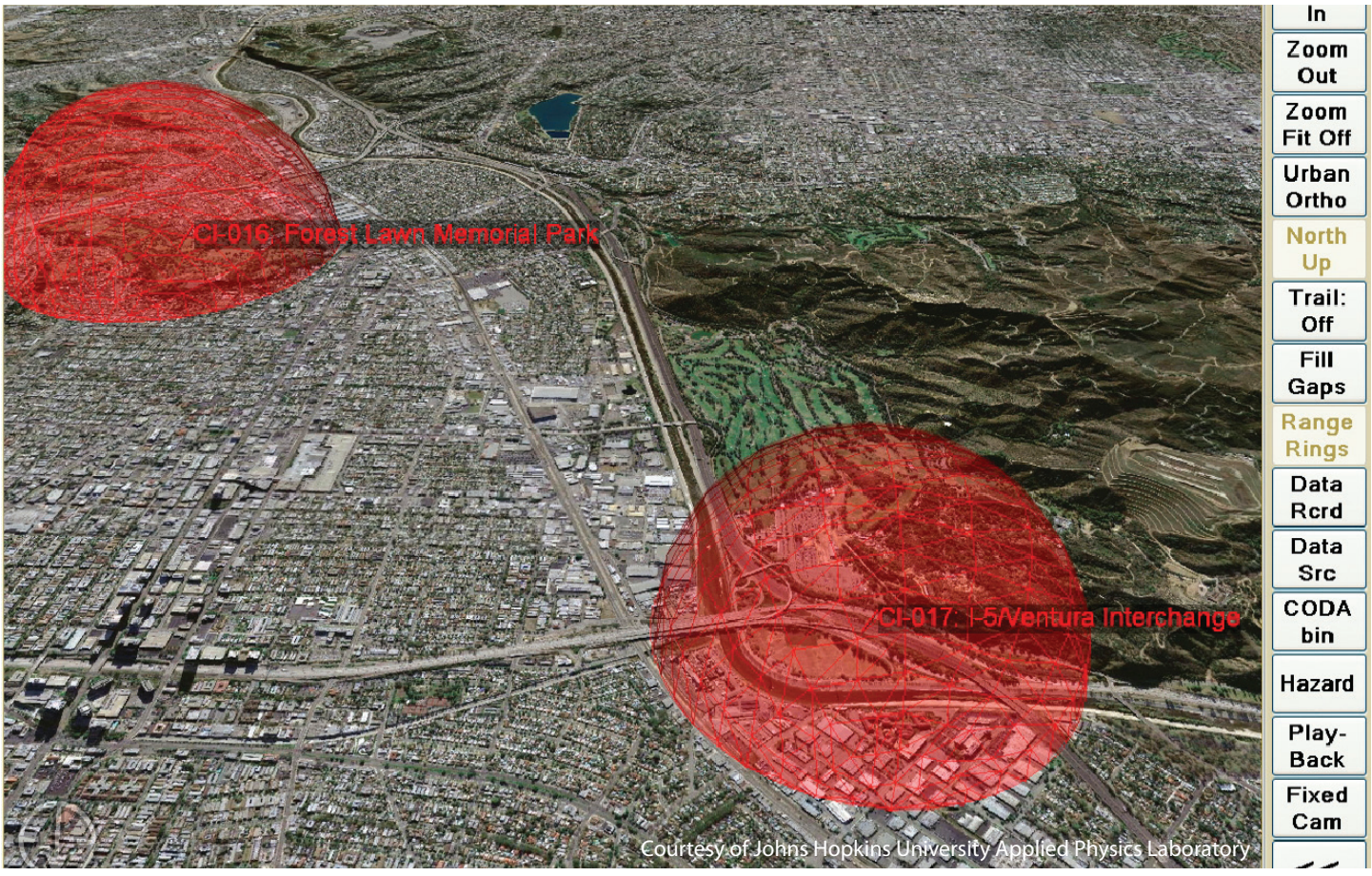
Building off the work in Maryland, in early 2009, DHS and the Los Angeles Police Department (LAPD) expanded the program by deploying CIIMS in Los Angeles, naming its version LA Shield.

"CIIMS-LA Shield has been highly successful in delivering a product that will enhance the security of the city of Los Angeles and for the other cities that will benefit from this tool in the future," says Sergeant James Harpster with LAPD. Harpster noted that "this project has been a true partnership; the developers have been out here working with us, offering advice and listening to our requirements and that has led to an efficient and effective outcome."

In February 2009, the LAPD used the adapted CIIMS technology during the Academy Awards and featured the advanced capability to communicate with the LA Shield computers while in flight by establishing a secure wireless network specifically for the event.

Given the success of CIIMS in improving infrastructure safety and security, efforts are underway to adapt the CIIMS tool for use by ground personnel or foot patrols, as well as its use in patrol-cars. Boyd commented that the expansion of CIIMS capabilities from aerial to ground use will further increase its value to the responder community.

CIIMS has a hardware price tag of $3,000, a relatively low cost that will help CIIMS be adopted across jurisdictions. Moreover, CIIMS is in a continuous process of improvement and modification to make it capable of meeting the disparate needs of various regions across the nation.



This screenshot of CIIMS is depicting the location of critical infrastructure that requires inspection.

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SECOND SIGHT

Hazmat Camera Allows First Responders to See Situations Safely

The more information first responders have in a hazmat-related emergency, the better they can respond to the crisis. Though they can get information from other first responders, radios, and written reports, there is no substitute for seeing the situation first hand. The Hazmat Cam, a wireless video camera developed at Idaho National Laboratory (INL) with funding from the U.S. Department of Energy, helps first responders see what they need to for hazmat incidents.

The Hazmat Cam sends encrypted video images from an incident location to a remote command post up to 2,000 feet from its receiver. The images are transmitted in real time to a three-antenna, true-diversity receiver. The receiver scans each of its three antennas more than 1,000 times per second and uses the strongest of the signals to enhance the stability of the picture. This method is an improvement over traditional wireless video receivers, which usually have only one antenna.

"It allows for a quicker, safer, and more accurate response," said Kevin Young, the INL engineer who developed the Hazmat Cam. "In addition to voice-only information over two-way radios, incident commanders at a hazardous [materials] response now have the ability to see emergency situations, allowing them to make better decisions." An optional transmitter and receiver system called the Extension Link can be used to extend the transmitting distance of the camera to over five miles. The Hazmat Cam has also been found to successfully transmit video from inside a 150-foot, three-deck steel fishing ship. Young noted the Hazmat Cam was designed to work in situations involving dense enclosures and can perform effectively in most types of buildings.

The INL-developed Hazmat Cam has a wide range of uses for first responders and military units.

Roughly 3½ inches in diameter and 6½ inches long, the Hazmat Cam can operate for more than three hours on a rechargeable lithium-polymer battery pack. The device is also waterproof, as the camera might need to be cleaned and decontaminated with liquids after being exposed to biological, chemical, or radiological substances.

The Hazmat Cam does have limitations. It cannot be operated in extremely high-heat environments, as the housing is made of Acrylonitrile Butadiene Styrene (ABS) plastic, which softens at temperatures above 140 degrees Fahrenheit. Young suggested that the product would be better used to investigate hazmat situations, such as methamphetamine labs, in which a fire outbreak does not occur.

The camera was originally part of an INL research project that examined how to improve video transmissions from one location to another. Young began developing a complete handheld video system after learning that National Guard units trained to respond to hazmat emergencies were interested in real-time video transmission.

The Hazmat Cam's rugged, waterproof exterior allows it to be fully submerged for cleaning and decontamination.

Second Sight (continued)

National Guard Civil Support Team members demonstrate the Hazmat Cam's capabilities during an exercise.

The National Guard Bureau funded additional project development, and National Guard Civil Support Teams were the first users of the technology. The project was later adapted for use by first responders, according to Young. He added that other emergency responders, such as search and rescue, firefighters, and police could also use the camera where real-time video images are needed.

James Blair, Deputy Fire Chief at INL, and his team have used the camera several times, once to check on a pressurized drum that was bulging. "We did a remote piercing of the flammable, bulging drum to investigate it. Without the camera, we would not have seen that the piercing worked," said Blair.

Blair reported that with minimal training, the camera is relatively easy to use. "If the commanders have skilled users, it is simple to install," he said. Young said that training is offered to first responders on setting up the camera and its transmission system. The enhanced version of the Hazmat Cam system will facilitate easier setup. Once set up, it is just a matter of turning it on, pointing, and the video footage is sent. The camera can be fully deployed in less than ten minutes.

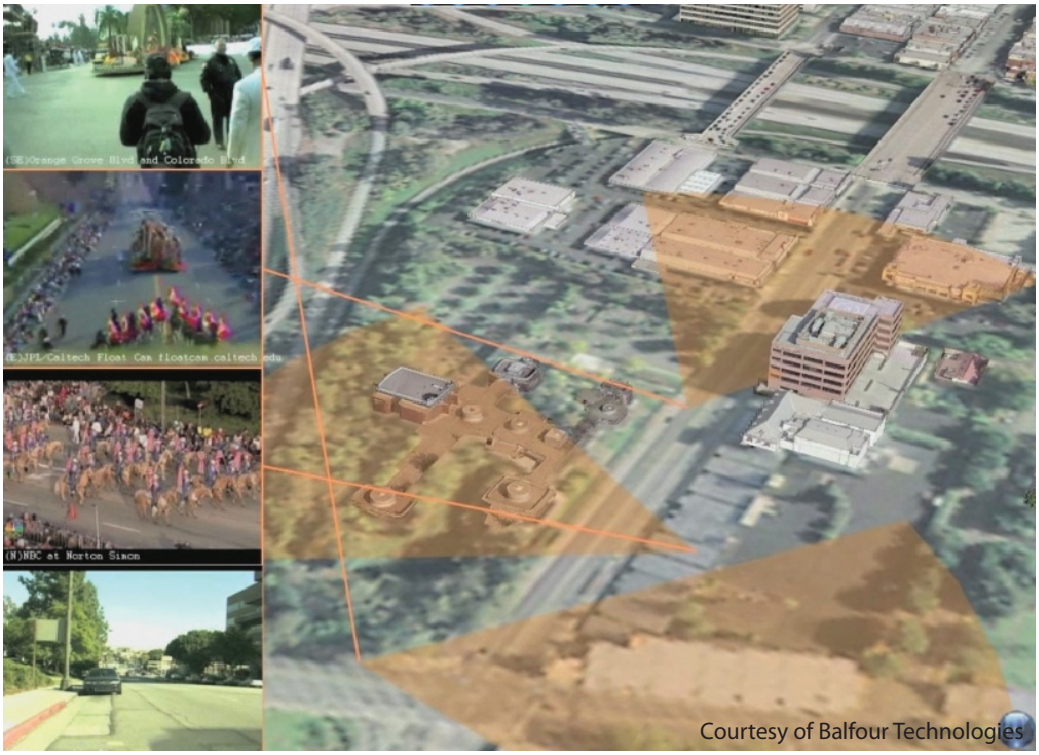
The product was commercially licensed by View Systems in Baltimore, Maryland and was marketed as the Visual First Responder from 2004 to 2007. Young is currently working on an enhanced version of the Hazmat Cam system, and INL is seeking a new licensee for the technology.

For more information on the Hazmat Cam, visit www.inl.gov/nationalsecurity/factsheets/docs/hazmat_cam.pdf. For information on other INL technologies, visit www.inl.gov.

EYES IN FOUR DIMENSIONS

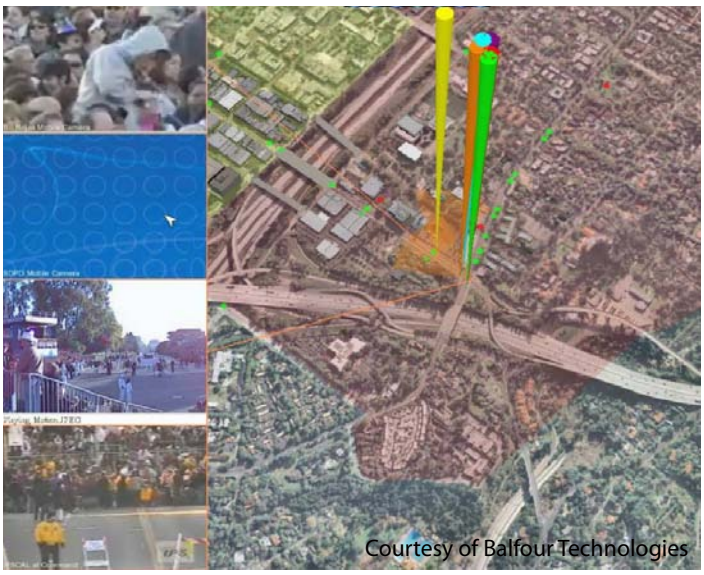
Surveillance Technology Helps First Responders Assess Events in Real Time

First responder and government agencies have various ideas about what a common operating picture (COP) should be. The U.S. Joint Forces Command defines a COP as "a single identical display of relevant information shared by more than one command. [It] facilitates collaborative planning and assists all levels to achieve situational awareness." Yet most COPs are nothing more than electronic push-pin situational awareness maps, based on the same technology used by civilians to get driving directions.



The fourDscape technology manages a large number of cameras and sensors and then displays the information in a high-resolution, four-dimensional view.

Upon arrival at the incident scene, first responders need to have an abundance of data available to them, as well as access to real-time sensors such as cameras, radiation detectors, and air quality monitors that continually feed data. Correlating, integrating, and effectively fusing all of the raw data and alerts into a cohesive and easy-to-understand COP is a tremendous challenge.



fourDscape COP at the '09 Rose Bowl Parade in Pasadena CA, providing fully integrated crowd surveillance of the parade route, tactical plan GIS datsets, and geo-tracking of mobile cameras and sheriff assets and personnel.

In response to this challenge, the U.S. Department of Homeland Security Science and Technology Directorate (DHS S&T) is sponsoring an innovative technology that can make this view relevant in a geographic context. The technology, named fourDscape, will help first responders quickly analyze situations in real time, interact with people on the scene, and coordinate a response to a clearly defined mission.

The fourDscape, developed by Balfour Technologies under a Small Business Innovation Research Program (SBIR) contract with DHS S&T, is able to manage a large number of cameras and other sensors in a virtual, high-resolution, four-dimensional (4-D) display on a computer. A "4-D display" includes the three traditional dimensions of space as well as the fourth dimension of time. The system goes farther than a basic satellite map of an incident scene overlaid with additional data layers, such as street names and building locations. First responders using fourDscape can also monitor video cameras at the incident scene, review the status of sensor networks, participate in video conferences with colleagues, and set alerts to receive contextual and interactive updates. The updates can help incident commanders make tactical decisions

Eyes In Four Dimensions (continued)

and understand the sum of an event while remaining on location. The system also allows for instant replay, enabling a forensic analysis of what has occurred in the past.

The fourDscape technology was tested in early 2008 during Operation Lupercale, a planning and emergency response exercise involving DHS and the Los Angeles County Sheriff's Department (LASD). The test simulated a scenario in which a car bomb and a radiological dispersion device, similar to a dirty bomb, were released during a large public event such as the 2008 Tournament of Roses Parade. Other groups involved in the test included the LASD Bomb Squad, the Hazardous Material Response Team, and other resources in the surrounding area of the County Emergency Operations Center of East Los Angeles.

For this test, the first responders used a 4-D virtual view of Pasadena. This view included publicly available county images taken from different and complex angles called *ortho* and *oblique*. Next, clear 3-D models of the parade route were added to the layered image. These were followed by simulations of float traffic, information from a police deployment plan, prerecorded traffic videos and images from wireless helmet cameras and a web camera on one of the floats.

"The fourDscape management engine took all of the data from those sensors and seamlessly fused them together into a single 4-D scene that was meaningful and useful to the police," said Stephen Dennis, project manager of the fourDscape at S&T's Homeland Security Advanced Research Projects Agency (HSARPA). "It gave us a chance to see what it would be like to have true situational awareness during a major, real-world event. It gave us, well, a not-so-common COP," he said.

fourDscape was also well received by the LASD. Lt. John Sullivan was one of the responders involved in Project Lupercale. He said, "The technology demonstrated the value of integrated visualizations for a variety of specialized responders and command elements."

Sullivan's agency has continued to test fourDscape. The technology was recently integrated into a practical field test during the 2009 Tournament of Roses Parade, which included the integration of global positioning system (GPS) tracking of select parade floats and LASD personnel. Real-time video feeds of the event were also integrated. Sullivan was pleased with the results of using fourDscape again. "The viewer performed well and again demonstrated the value of 4-D visualization for tactical and operational applications," he said.

For more information on Balfour Technologies and the fourDscape technology, visit www.bal4.com.

3D building model geo-located on a campus, aerial imagery with floor plans overlaid, and responders being tracked through the building.

THE RESPONDER KNOWLEDGE BASE

Who's Using It?

The Responder Knowledge Base (RKB) provides emergency responders, purchasers, and planners with a trusted, integrated, online source of information on products, standards, certifications, grants, and other equipment-related information. While the majority of RKB users are active responders, there are others who also visit www.rkb.us to view or share content relevant to the emergency response community. There are four user types:

- **Public Users.** Public users have access to the majority of information on RKB. A registered public user receives additional benefits such as the MyRKB feature, access to watch lists, and the ability to submit an Ask an Expert question. Public users may include students, researchers, and industry experts.

- **Industry.** Manufacturers who are interested in providing information on their products can sign up as an industry user. Industry users have the same access level as public users.

- **Responders.** Responders have access to the same information that public users have, as well as additional content, such as product records or publications with limited distribution.

- **Federal Government.** Federal government users have access to all published information on RKB. State and local governments should register under the "Emergency Responder" user category if they are emergency planners or perform other response-related functions.

Content administrator access levels are granted for users who wish to share information with the response community. Such users include:

- Manufacturers uploading product data screened by the RKB staff;

- Government agencies publishing research, publications, or test results; and

- Other responder organizations with information to share.

If you have any questions, please contact the RKB help desk at RKBMailbox@us.saic.com or 1-877-FEMA-RKB (1-877-336-2752). If you are a registered user, you can also enter an online question through the Ask an Expert module.