



Photo courtesy of CREATE



NEWSLETTER

The Newsletter of the First Responder Technologies Program

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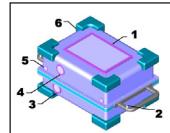
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*This Newsletter discusses technologies of interest to first responders that have received funding, in part, from the Federal government. Mention of these technologies should not be construed as an endorsement of either the technology, or the entity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

To download a copy of this newsletter, visit:  
<http://www.firstresponder.gov/Pages/NewsLetterPage.aspx?NewsLetter=current>

# MAPPING THE FUTURE

## Computer Software Prepares First Responders for Disaster

While disaster planning may not keep an event from occurring, it can mitigate its effects. Effective disaster planning depends not only on accurate and timely data but also on the ability to make the data meaningful. The Federal Emergency Management Agency (FEMA) offers a free risk-assessment software program to help emergency planners contend with natural disasters. The program, Hazards U.S. Multi-Hazard (HAZUS-MH), harnesses the power of geographic information systems (GIS) to estimate the probability and potential consequences of earthquakes, hurricanes, and floods.

"Imagine being able to look into a crystal ball to see the outcome of a disaster and using that information to develop plans to mitigate the damage. That is the idea behind HAZUS-MH," said Eric Berman, FEMA's HAZUS Program Manager.

GIS offers the ability to integrate a variety of geographic-related data. A single map can display information such as population, available resources, elevation, and land characteristics simultaneously. When combined, this information can aid in the identification of vulnerable areas, assessment of an area's readiness to deal with a disaster before one occurs, estimation of potential losses from specific hazardous events, allocation of resources for the most effective and efficient response, and prioritization of mitigation measures for future implementation.

HAZUS-MH currently supports three types of hazard events: hurricane, flood (both coastal and riverine), and earthquakes. National data sets included with the software contain information on selected hazard data, boundary maps, aggregated building information, essential facilities, and high-potential-loss facilities. In addition, users can enter site-specific information to tailor the software to their own area and needs.

Joshua Friedman, Hazard Impact Modeler in the New York City (NYC) Office of Emergency Management (OEM), has been working with HAZUS-MH for the past year and used it in the development of NYC's national hazard mitigation plan. With the help of FEMA, Friedman was able to customize data sets to accurately reflect NYC's unique environment.



Photo courtesy of FEMA

HAZUS-MH can provide information in a variety of categories, including direct damage, induced damage (such as a hazardous materials release or debris generation), direct losses (such as cost of repair, income loss, crop damage, casualties, and shelter needs), and indirect losses (such as supply shortages, sales decline, and long- and short-term economic impacts). In addition, the software allows the user to build "what if" scenarios to determine the effects of mitigation efforts. Users can obtain information on individual structures or an aggregate view of an area.

The HAZUS-MH software, developed through a joint collaboration between FEMA and the Environmental Systems Research Institute (ESRI), works as an add-on to ESRI's ArcGIS 9 software. "If you are familiar with ArcGIS," Friedman said, "you can ramp up pretty quickly." "It's good science," he said, "and we plan to use it going forward."

Federal, tribal, state, and local government agencies and the private sector can obtain HAZUS-MH free of charge by completing the downloadable order form available at [www.fema.gov/library/viewRecord.do?id=2898](http://www.fema.gov/library/viewRecord.do?id=2898).

For a demo of the HAZUS-MH software, visit [http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product\\_ID=851](http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product_ID=851).

# RANDOM ACTS

## Software Program Keeps Would-be Terrorists Guessing

All attackers, whether street criminals or terrorist organizations, look for patterns in security patrols to determine when a target is most vulnerable. A project developed by the Center for Risk and Economic Analysis of Terrorism Events (CREATE), a U.S. Department of Homeland Security (DHS) Center of Excellence at the University of Southern California (USC), is working to mitigate that vulnerability. Their project, Assistant for Randomized Monitoring Over Routes (ARMOR), eliminates the predictability of security patrols, checkpoints, and other scheduled and routine security measures.

Security resources are limited, and many decisions must be made: What are the most important potential targets? How should total available resources (manpower and time) be divided to provide maximum security coverage for each installation? In some instances, resources are divided equally to provide equal protection to installations that might be of interest to attackers.

This is not the most effective method, according to Dr. Milind Tambe, Professor of Computer Science at USC. "Different targets are of greater interest to terrorists than others, and a particular structure can be more important at certain times of the day than at others." According to Tambe, some security directors might divide their security resources so that more weight is given to more important targets. This, however, leaves other structures vulnerable.



Photo courtesy of CREATE

Attackers will take advantage of such vulnerabilities, even if it means choosing a target of lesser importance. "What fraction of time at each is optimal? That is what we have set out to determine," said Tambe.

The goal for the ARMOR software is to balance security coverage while eliminating predictability. To accomplish this task, the software uses a branch of mathematics known as game theory. Game theory can be used in any situation where a person's success depends on the choices made by others. Examples of this would be chess or "rock, paper, scissors." It uses mathematical algorithms to measure the risk associated with a variety of scenarios and that information is used to determine the course of action that will provide the best outcome. The result is risk-based randomization.

"This cost-effective and innovative research has the potential to revolutionize the process of security at many critical infrastructure facilities including ports and airports," said Dr. Matthew Clark, Director of the Office of University Programs at the DHS Science and Technology Directorate (S&T).

The ARMOR project evolved out of unwanted randomness. In 2003, graduate student Praveen Paruchuri was working on a project to coordinate robot movement and repeatedly encountered randomness in his algorithm. The randomness was the result of an error, but would ultimately become the basis of the ARMOR project and the backbone of the security arsenal at Los Angeles International Airport (LAX).

Erroll Southers, Assistant Chief of the LAX Airport Police (LAXPD), has been familiar with the work of CREATE for some time. While working as Deputy Director for Critical Infrastructure Protection (CIP) for the State of California, Southers turned to the CREATE team to help him determine the most defensible method for allocating homeland security grant funds. Southers was later recruited as Associate Director of Special Programs on the CREATE team. When the LAXPD approached him about joining their team, he did so with the stipulation that he could remain affiliated with CREATE.

*Random Acts (continued)*

After joining LAXPD, Southers noticed over time that "randomly" assigned checkpoints at LAX showed patterns that could be detected by potential attackers. Southers took the problem to his colleagues at CREATE. The randomness that had once been a problem now became the subject of a theoretical research project undertaken by James Pita, one of Tambe's students. This theoretical research project became the ARMOR project.

The pilot of the ARMOR project was conducted at LAX beginning in the fall of 2007. "With the ARMOR system in place," said Southers, "we've noticed an increase in the seizure of weapons and narcotics, and in the identification of persons of interest."

In January 2009, LAX police confiscated numerous weapons at ARMOR checkpoints, including loaded automatic guns, making it one of the most productive months in weapons seizures at the airport. The airport has attributed this success to the use of CREATE's ARMOR system.

One advantage of the system is that it is scalable. Southers reports that managers of rail, port, and other infrastructure targets across the country are showing an interest in ARMOR. ARMOR is now being used in other applications as well. For example, the Federal Air Marshal Service (FAMS) has recently begun using the system under the name, Intelligent Randomization in Scheduling (IRIS). With approximately 29,000 commercial flights per day in United States airspace, FAMS prioritizes allocation based on risk. The current process follows the FAMS Concept of Operations and the DHS risk methodology by assigning FAM resources based on consequence, vulnerability, and threat. IRIS is helping FAMS in applying randomness in the selection of a set of high risk flights to increase terrorist uncertainty of FAMS deployments.

Additionally, the Transportation Security Administration is initiating a pilot of the ARMOR/IRIS program in one airport, with the view to expanding it to airports across the country if it is successful.

"Terrorists spend a great deal of time and money picking their targets. If there isn't a predictable probability of success, they will not go after a target, so there is a deterrent factor," Southers said. He also noted that terrorists eventually adapt to new technologies: "As we change, terrorists change. The bad guys know we have it, but they don't know how it works." To ensure they stay one step ahead of the bad guys, the team at CREATE randomly tests the software for vulnerabilities and tweaks it so that it remains unpredictable. "We are putting ourselves in the position of being as unpredictable as the terrorists," Southers said.

For more information on ARMOR, visit the CREATE Website at [www.usc.edu/create](http://www.usc.edu/create) or Dr. Tambe's website at <http://teamcore.usc.edu/security>.



Photo courtesy of CREATE

# LONG-DISTANCE TRIAGE

## Vital Sign Monitoring from up to 40 Feet Away

Even with current technology, figuring out who needs medical care at the scene of a disaster still requires the old-fashioned methods: bending over a victim and checking body temperature, heart rate, and muscle movement. The entire process can take three to five minutes per person.

Time is the most precious resource in a crisis, so every second shaved can be a life-saver. With this in mind, the U.S. Department of Homeland Security Science and Technology Directorate (DHS S&T) is leading the development of the Standoff Patient Triage Tool (SPTT). The SPTT takes key physiological readings necessary to any diagnosis – pulse, body temperature, respiration – from an injured person at a far distance. In short, it's triage at 20 paces in less than 30 seconds.

"We thought, 'Boy, wouldn't it be nice if a responder, fully clothed in an emergency suit, could have a technology to take vital signs quickly from 5 to 40 feet away?'" said Greg Price, Director of S&T's TechSolutions program, which is managing the SPTT project in a partnership with the Technical Support Working Group (TSWG), Boeing, and Washington University's School of Medicine.

Behind SPTT is a technology known as Laser Doppler Vibrometry, which has been used in aircraft and automotive components, acoustic speakers, radar technology, and landmine detection. When connected to a camera, the vibrometer can measure the velocity and displacement of vibrating objects. An algorithm converts those data points into measurements that emergency medical responders can use in their rapid assessment of a patient's critical medical conditions.

The goal for the initial prototype is to develop a unit about the size of a legal notebook and as thick as a ream of paper. Reaching this goal will require further testing of optical stabilization technology to make sure the unit can function despite a responder's arm and hand movements.

Besides providing accurate data, the SPTT can help overcome common human biases at an accident scene.

"Human nature is to pay attention to the person who is screaming and bleeding, but someone else with a less obvious internal injury may need to be the first priority," said Price. "In the case of large-scale triage, it is not always

the squeaky wheel that needs the grease. The SPTT may someday help first responders hear a lot more from their patients and much more quickly."

With the help of Washington University, researchers have found that the best place to capture strong readings of vital signs is on the carotid artery, although strong signals have been obtained from the head, chest, abdomen, and even a foot. Researchers are also testing whether readings could be taken when someone is lying in an awkward position or wearing multiple layers of clothing. The results have been encouraging.

DHS S&T has high hopes for the technology. Price noted, "In a large triage situation, it could become a lifesaver."

The final test for the SPTT is the first responders themselves. TechSolutions wants to put working prototypes in the hands of medical teams this fall for extensive field tests.

For more information on the TechSolutions program, visit [www.TechSolutions.DHS.gov](http://www.TechSolutions.DHS.gov).

A version of this article was previously published in the DHS Science & Technology Directorate's SNAPSHOTS electronic newsletter. Visit [www.dhs.gov](http://www.dhs.gov) and Search "Snapshots."

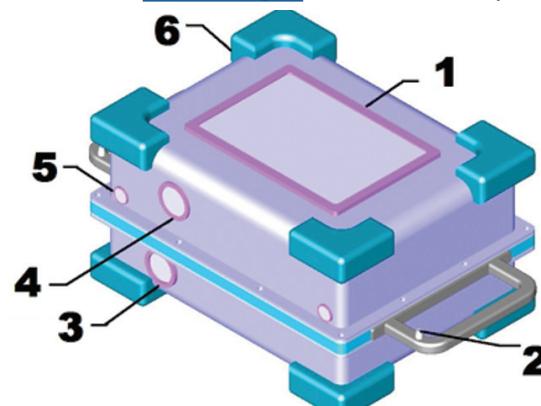


Photo courtesy of Boeing Phantom Works

A drawing of the proposed 15" x 8.5" x 6" SPTT with the following features. (1) 4" x 6" display window; (2) Control button; (3) Infrared camera window; (4) Visible camera window; (5) Ranging subassembly window; (6) Shock bumpers.

TechSolutions is an element of the First Responder Technologies (R-Tech) program of the U.S. Department of Homeland Security Science and Technology Directorate. The goal of TechSolutions is to help develop technologies that fill capability gaps identified by the first responder community. For more information about TechSolutions, visit [www.TechSolutions.DHS.gov](http://www.TechSolutions.DHS.gov).



# THE RESPONDER KNOWLEDGE BASE

## Product Information on RKB

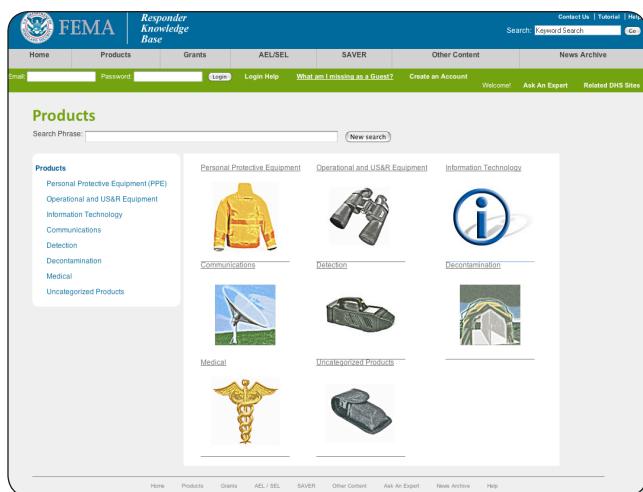
The Responder Knowledge Base (RKB) contains approximately 6,000 product records from over 1,300 organizations. RKB staff continually seeks out new technologies and products that may be relevant to the first responder community.

Despite the number of products found on [www.rkb.us](http://www.rkb.us), RKB is not an exhaustive list of what is available in the market.

When performing a product search on RKB, items will appear with appropriate special interest icons, providing further information to the responder community. These icons and their definitions are displayed in the image to the right.

In addition, you will find links from products to many other relevant content areas on the site. It is important to note that just because a product appears on the RKB Website, this should not be construed as an endorsement by the Federal government of either the technology or the entity producing it.

For more information on product records contained on RKB, please e-mail [RKBMailbox@us.siac.com](mailto:RKBMailbox@us.siac.com) or call 1-877-FEMA-RKB (1-877-336-2752).



The screenshot shows the RKB website's products page. At the top, there's a navigation bar with links for Home, Products, Grants, AEL/SEL, SAVER, Other Content, and News Archive. Below that is a login section for DHS users. The main content area is titled "Products" and features a search bar. Underneath the search bar is a sidebar with categories: Personal Protective Equipment (PPE), Operational and US&R Equipment, Information Technology, Communications, Detection, Decontamination, Medical, and Uncategorized Products. The main content area displays six product categories with corresponding icons: Communications (satellite dish), Detection (binoculars), Decontamination (decontamination symbol), Medical (caduceus), Uncategorized Products (black bag), and Information Technology (i-circle). At the bottom of the page are links for Home, Products, Grants, AEL/SEL, SAVER, Other Content, Ask An Expert, News Archive, and Help.

### CBRN

NIOSH CBRN Approved: This icon indicates respiratory protection products that have been approved by the National Institute for Occupational Safety and Health (NIOSH) as meeting one of the NIOSH Chemical, Biological, Radiological, Nuclear (CBRN) Statements of Standard. On the display page for that product, the NIOSH certifications will appear in the Knowledge Links box on the right side of the page.



Third-Party Certification(s) available: This icon indicates products that have been tested by a third party. On the display page for that product, the certification(s) will appear in the Knowledge Links box on the right side of the page. This icon will not appear if an item is self-certified to a standard by the manufacturer.



Operational Assessment(s) available: This icon indicates products that have at least one associated Operational Assessments Report, such as a comparative test through the System Assessment and Validation for Emergency Responders (SAVER) Program. Operational Assessments can be either single-product or comparative, but always offer independent test results in realistic conditions or against live agents. On the display page for that product, the Operational Assessment(s) will appear in the Knowledge Links box on the right side of the page.



User Opinion(s) Available: This icon indicates products or training courses that have at least one user opinion giver on the site. On the display page for that product, the user opinion(s) is located in the Knowledge Links box on the right side of the page.

### TSA

Transportation Security Administration (TSA): This icon indicates products that are on the TSA's Qualified Products List (QPL). The QPL is maintained by TSA and the Transportation Security Laboratory and indicates what equipment has been qualified for use in airports. For a product to be placed on the QPL, it must meet both laboratory testing and operational performance requirements.