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Arming Against Chem-Bio Attacks

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A unique chemical and biological detection system is set to protect South Korea.

In the coming months, U.S. forces in Korea likely will begin receiving an interim capability system that will set off alarms in case of medical pandemics or attacks involving chemical or biological agents. The system collects data from a variety of sensors and fuses the information so that officials can make timely, effective decisions in an effort to save lives.

Pending a positive outcome from a recent operational demonstration, the Joint United States Forces Korea Portal and Integrated Threat Recognition (JUPITR) advanced technology demonstration (ATD) soon will begin fielding the technology. "The intent is to field it to the first place, which would be Busan, Pier 8, the third quarter of fiscal year 2016," reports Ken Kammerer, director, experimentation and demonstrations, Joint Program Executive Office for Chemical and Biological Defense. "We're refining the concept of operations for Pier 8, and the next location is probably Camp Humphreys, which is larger, so JUPITR would probably not be fielded there until the next year."

The JUPITR program introduces new instrumentation that increases the speed and ease of biosurveillance equipment for the United States Forces Korea. The instrumentation also comes at a lower cost, requires less training and places less burden on the soldier while offering high-performance results, according to program documentation. JUPITR's presence on the Korean Peninsula aligns with the joint force's strategy to rebalance military efforts toward the Asia-Pacific region.

JUPITR integrates four capabilities military officials compare to legs of a stool. "The four legs are integrated together to give strategic situational awareness to help a commander make a well-informed, rapid decision that will help save lives by improving force protection or medical countermeasures," Kammerer offers.

The first leg, the Biological Identification Capability Sets (BICS), provides what Kammerer refers to as "orthogonal information" to achieve theater validation, meaning a very high degree of confidence in the analysis of chemical or biological agents. Theater validation involves multiple analyses with at least two complementary, or orthogonal, technologies, such as polymerase chain reaction and electrochemical luminescence. Polymerase chain reaction technology amplifies a single copy or a few copies of a piece of DNA across several orders of magnitude, generating thousands to millions of copies of a particular DNA sequence. Electrochemical luminescence is light produced during electrochemical reactions in solutions.

That validated information is loaded into a second leg, the Biosurveillance Portal (BSP), a Web-based enterprise environment that facilitates collaboration, communication and information sharing to support the detection, management and mitigation of man-made and naturally occurring biological events. "The BSP has been used in Korea for a while. Lots of people already have accounts, so they can get the situational awareness," Kammerer says.

The Assessment of Environmental Detectors (AED) is the third leg. Officials are comparing a variety of commercial and government-off-the-shelf sensors that detect, collect and identify aerosol biological sensors. Ultimately they will select those that best meet the requirements. Program officials recently conducted live agent testing on the environmental detection candidates. That testing was expected to be completed by the end of February.

The final leg is an early warning system that seeks to combine force protection surveillance tools into a single integrated system so military police and chemical-biological specialists immediately can cross-check their data and respond to incidents faster. "It's going to take the input of these force protection sensors—I'm talking cameras, radars, acoustic sensors, standoff and point sensors as well as a biological point detector. They will all feed into a common operating picture typically located in an emergency operations center," Kammerer explains. "The intent is to take these different sensors and fuse the information into a common operating picture in front of the commander at the emergency operations center to where he can now make a high-confidence decision."

Fusing the sensor data is important because a single sensor cannot do it all. "Each one has certain limitations. Some have false alarms. Some don't detect certain things. Others don't identify some things," Kammerer asserts.

He paints a disturbing picture to illustrate how JUPITR will work. "Imagine a biological cloud coming in where someone has released some sort of spray, and it comes across the post or pier that you're protecting," Kammerer begins. In the hypothetical scenario, standoff sensors detect the cloud. Force protection sensors, such as cameras or ground radar, observe the vehicle spreading the agent. The cloud then moves over a point detector. "Now the point detector goes off and gives an identification. I have an identification from the sensor, and I'm going to take a sample to the BICS lab, and it's going to give me a theater validation that it is a biowarfare agent."

The information then can be shared rapidly. "It will actually go across installations, and the entire Korean Peninsula can now have a strategic overview of what's going on in that theater," he adds.

The JUPITR system offers benefits beyond chem-bio attacks. The biosurveillance portal, for example, can help detect the natural spread of disease. "It's really good for seeing things like a pandemic because information is coming from a lot of different medical databases," Kammerer says.

The system underwent operational testing in June at Osan Air Base. During a simulated exercise, military police were able to notify chem-bio specialists that a suspicious vehicle was in the area. The specialists watched the truck on-screen and alerted the military police that a standoff chemical-biological sensor had sounded the alarm.

Within minutes, the base commander can be informed and take charge of the response, base personnel can suit up in their personal protective equipment, and the Army and Air Force chains of command can be notified.

The operational demo included integration of the Joint All-Hazards Common Control Station, which has been used in Afghanistan, to provide additional data. Kammerer says he believes the results of the operational demonstration were positive, but the report has not yet been finalized.

The advanced technology demonstration already has had results. Some technologies have transitioned to regional laboratories and are in use. Additionally, beginning this fiscal year, the BSP is transitioning to a program of record known as the Global Biosurveillance Portal. Kammerer describes it as a fast-moving program expected to provide an interim operational capability within a year. "The information gathered during the JUPITR ATD actually helped jump-start that," he says. Program officials have developed transition plans for other components as well.

The system still needs to undergo some cybersecurity testing. "To put it on the network at Osan Air Base and Pier 8, we will have to update the information assurance, and that's where we're going to do the cyber testing," Kammerer says.

JUPITR officially kicked off in April 2013, and Kammerer indicates that the team chose the ATD path for good reason. "You can rapidly develop new and novel capabilities, define concepts of operation and conduct technical and operational demonstrations of the systems in their intended environments. That's obviously much more rapid than a traditional acquisition program," he says, acknowledging that the effort is limited to fielding an interim capability with United States Forces Korea.

Fielding the system elsewhere would require much more work that goes beyond the scope of the ATD. "If this is successful when we provide this interim capability, we can take it and perhaps get it into a program of record. A program of record has the opportunity to get it to a larger body of people," he says. "It works, and I definitely think it would have the capability to work in other places."

- See more at: http://www.afcea.org/content/?q=Article-arming-against-chem-bio-attacks#sthash.q0XmllHs.dpuf