Joint Contaminated Surface Detector Takes Off at Former Army Airfield

By Lieutenant Colonel John M. Riley and Master Sergeant Mark Nicholson

Recently, industry and Army personnel joined together at a little-known National Aeronautics and Space Administration (NASA) launch facility in New Mexico to test a piece of emerging technology that could represent the next generation in chemical reconnaissance.

Now a launch facility for NASA research balloons, Fort Sumner, New Mexico, last played a significant role in our Nation's defense during World War II. At that time, pilots and crews of the IX Troop Carrier Command conducted training in cargo aircraft and gliders over the wide-open grasslands of New Mexico before heading to Europe to deliver American paratroopers and glider forces for combat. Most of the Fort Sumner hangars, administrative buildings, and barracks are long gone. However, the wide-open ranges, gravel and dirt roads, large asphalt runways, and concrete parking aprons present ideal conditions for testing a developmental technology that shows great promise in returning chemical reconnaissance to the front of maneuver forces.

Maintaining momentum, speed, surprise, and shock remains the key operational component for U.S. commanders. The Chemical Corps continues to develop new technologies to provide the rapid reconnaissance necessary for clearing routes ahead of combat formations. The Joint Contaminated Surface Detector (JCSD), part of an advanced concept technology demonstration sponsored by the Defense Threat Reduction Agency, is showing promise as a component of chemical, biological, radiological, and nuclear reconnaissance systems of the future.

Originally demonstrated in Alaska more than two years ago, the JCSD presented the joint community with a Raman spectroscopy-based sensor[1] that showed flashes of great promise. However, in those early stages of development, the JCSD was nagged by a number of technological and hardware challenges that forced it back into further development and refinement.

In November 2008, the JCSD Generation 3 was tested in New Mexico. In a series of trials conducted by the Edgewood Chemical Biological Center, the U.S. Army Test and Evaluation Command, and an operational management team from the U.S. Army Pacific (USARPAC), the JCSD proved to be consistently reliable across variable terrain that replicated the test criteria for existing chemical reconnaissance systems. And the JCSD is fast! With a laser that fires at a rate of 25 pulses per second at the heart of the sensor, the JCSD is capable of operating at sustained speeds supportive of the rapid and independent employment of mobile brigade combat teams. For this test, sensors were mounted on a humvee platform; but the JCSD package could be installed as a component on a wide variety of platforms.

Chemical reconnaissance is recognized as a very deliberate process, and the JCSD provides the maneuver force with yet another combat multiplier to ensure force protection when operating in a potentially contaminated environment. The JCSD could help minimize the risk as it facilitates rapid movement of forces across all types of terrain. On cross-country terrain consisting of grass, dirt, and rocks, the JCSD consistently detected chemical agent simulants while traveling at the established test speeds of 11 miles per hour (mph). Similarly consistent results were obtained on secondary dirt and gravel roads at test speeds of 30 mph.

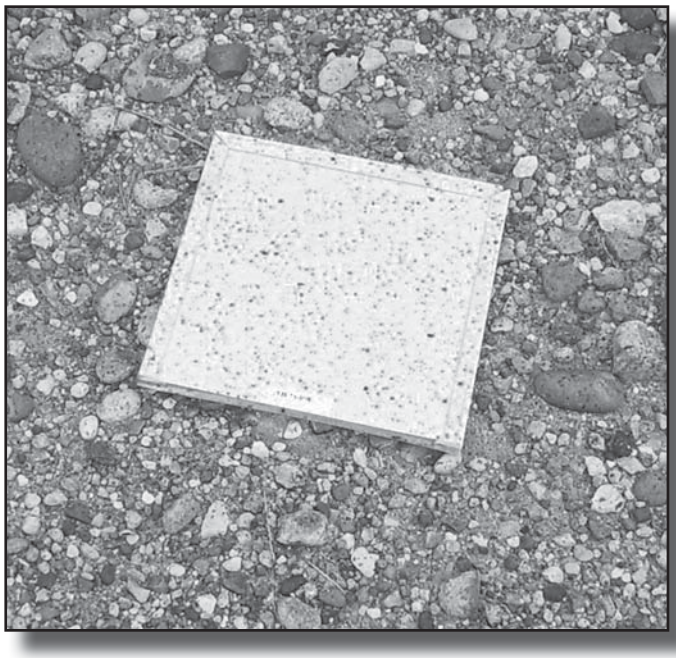
But, the assembled team of evaluators and observers was most impressed when the JCSD moved to hard surfaces. While operating at a speed of 45 mph on concrete and asphalt, the JCSD consistently detected chemical simulants more than 90 percent of the time.

The combined management team is quick to point out that the JCSD is probably capable of satisfactory performance at even greater speeds. However, due to safety considerations for operation of the humvee-mounted shelter, the Army strictly limits on- and off-road operating speeds.

The humvee-mounted JCSD conducts sampling along a secondary trail at Fort Sumner, New Mexico.

A member of the USARPAC Operational Management Team pointed out that "The JCSD was not simply making one detection during a run—it made multiple hits!" Over the course of a test run, the JCSD was expected to detect an agent simulant while traversing a controlled and considerably narrow spray pattern. On improved surfaces, the JCSD typically traversed the sprayed area in just a few seconds. Rather than recording just one agent detection, the system regularly registered multiple agent detections on each pass.

In the New Mexico test, data was captured for each platform that made a run over the simulant spray pattern. The results were very positive. If the data is reviewed from the perspective of a chemical reconnaissance section operating in tandem, the JCSD posts an impressive probability of detection equal to or exceeding that of joint chemical reconnaissance requirements—and, again, at operational speeds that support the rapid movement of combat forces on the battlefield.



Multiple "referee" cards were used on each spray path to ensure that droplet distribution patterns were representative of established testing procedures for chemical, biological, radiological, and nuclear reconnaissance systems.

JCSD Test Plan Basic Parameters

- Two humvee systems operating in tandem
- Sampling tests conducted over varying surfaces:
  - Concrete
  - Asphalt
  - Secondary/unimproved roads
  - Cross-country
- Sampling speeds established for tests:
  - 5 and 11 mph cross-country
  - 15 and 30 mph on secondary roads
  - 30 and 45 mph on concrete and asphalt

In the coming months, USARPAC will prepare a joint military utility assessment of the JCSD sensor technology based on nearly three years of cumulative data as the operational manager for the Chemical, Biological, Radiological, and Nuclear Unmanned Ground Reconnaissance Program. Pending the outcome of the joint military utility assessment, the Joint Program Executive Office for Chemical and Biological Defense is postured to move the evaluation of the technology from the advanced concept technology demonstration to a transition manager for further development and testing. In the meantime, the JCSD has provided evidence that this technology has the potential to meet the need for rapid and reliable chemical detection in the future force.

Endnote:

[1]Raman spectroscopy is a specroscopic technique used to determine the properties of a substance. The technique is named after Sir Chandrasekhara Venkata Raman, an Indian physicist and Nobel laureate recognized for his work in the molecular scattering of light.

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