CAT 1ST RESPONDERS TESTING VIDEO: FINAL SCRIPT JANUARY 28, 2009

Field radio:
Field 3 to Manhattan, urgent.
The other tower has just collapsed. Major collapse! Major collapse!
Urgent. 2-8-9 to Manhattan, urgent.
The World Trade Center collapsed. Building two has collapsed.
Urgent, urgent. The World Trade Center has collapsed. Building two has collapsed.

Narrator:
The terrorist attacks of 9/11 have changed our nation forever.

Field radio:
Negative on any chief. K. Right now we're all alone. The second building came down. I can't see. So we have no contact with anybody at this time. K.

Narrator:
Firefighters and other first responders at the Twin Towers and Pentagon were ill-prepared to deal with the complex situation created by the magnitude of injury, death, and destruction. America has also had to deal with many natural disasters such as fires, hurricanes, earthquakes, and tornadoes which bring similar complex situations. In understanding the problems which must be dealt with in both terrorist and natural disasters, Congress, in 2003, directed the Department of Defense to execute a program to transition technologies and products into America's first responder organizations.

This video serves to document efforts by The Center for Commercialization of Advanced Technology in support of the Office of Secretary of Defense' 1401 Program to assist in this transition program.

On-camera Tom Sheffer:
The mission of CCAT is to identify and support the rapid transition and commercialization of new innovative technologies that could potentially solve critical nation defense and homeland security problems. We do this by working with key DOD agencies and homeland security agencies to gain an understanding about what their critical technology needs and requirements are. And then we go out and invite companies university labs, government labs, to submit proposals that could potentially solve these technological needs.

Narrator:
CCAT's partnership with the Department of Defenses' 1401 Program intends to accomplish the same goal: identify innovative and mature technologies developed through DoD funding and to transition these technologies to the 1st responder community as quickly and efficiently as possible.

They began by identifying critical technology gaps for first responders in the areas of Command, Control and Communications for situational awareness. CCAT then launched a national solicitation for companies that had developed these potential technologies with DoD funding. CCAT then awarded funding to 3 companies with 3D Personnel Location and Tracking in GPS denied environments which was one of the most critical technology gaps identified.

On Camera: Derry Connolly
After a competitive and open solicitation, CCAT selected two companies to fund. The funding enabled a battery of test and validation exercises in partnership with local San Diego county first responders.

Narrator:
The first company, Chi Systems of Poway, California, has received nearly $10 Million in DOD funding to develop their Small Unit Situation Awareness system. It displays real-time positioning data, overlaid on building maps for the incident commander, and on portable PDA's. Communication can be over any wireless network. Chi used a Harris 400 Mhz tactical radio.

The second company, Sedona Strategies of Plymouth, New Hampshire, has licensed the "Advanced 3D Locator System" developed by L3 Communications with partial funding from the Air Force Research Laboratory, DARPA, DHS, and CERDEC . This system does not require an existing communications infrastructure; rather it uses an ad-hoc wireless mesh network. Sedona Strategies used a 900 Mhz radio.

Working with the 1st responder community in the San Diego County region, a series of demonstrations were conducted. The tests were designed in harsh situational conditions, in order to fully understand the issues and characteristics of the problem. The tests were conducted at an underground storm drain facility, a convention center and a major detention facility. The scenarios included search and rescue of downed firefighters, an officer in distress, and hostage situations. The first responders involved with the testing were briefed that these tests were expected to be only a step along a path to deployment and would serve to give them a better idea of what would be practical to expect.

The first test was in a subterranean storm drain. The facility was selected to represent the rescue of a downed firefighter in buildings with difficult subterranean floors. The scenario involved using a search and rescue team to locate a downed firefighter deep inside the storm drain.

Due to the unique characteristics of the storm drain's cylindrical shape, the Sedona Strategies and their 3D Locator System for First Responders, anticipated RF issues that could impede communications.

Fire captain into radio, on -camera:
Entry team coms go ahead on VHF.
Okay, we've lost coms on 800...

Narrator:
To minimize this problem they used a relay unit which was placed at the entry point of the storm drain to act as a repeater to the base station, located approximately 150 feet away. Without this repeater, reliable communications could not be established.

The CHI Systems Small Unit Situation Awareness for First Responders, or SUSA system, had a fire captain monitoring the location of the firefighters, along with a base station. The accuracy of both the downed firefighter and the rescue firefighters were accurately monitored throughout the exercise. When the rescue firefighters linked up with the downed firefighter, their locations were measured within 10 feet of each other.

The conclusions reached were the following:
1. With 900 Mhz radios, data communications were maintained at 200 feet, well after voice

communications ceased.
2. The responders searching for the downed firefighter came within 10 feet of the target after a few minutes of data lag.
3. The system's location algorithms and inertial navigation sensors worked extremely well.
4. Relay units are not practical in a rescue scenario. A possible solution would be to place directional antennae on the responders.

The San Diego Convention Center was used as another location. This multi-storied facility represented what would be a unique challenge to first responders: hundreds of thousands of square feet of meeting rooms, banquet facilities, ballrooms and an underground parking structure. The first scenario involved a downed officer whose location was known to be within a 300 by 100 foot area. A search for the officer would have to be conducted through several rooms on the third floor.

One team walked along the hallway searching for the correct room to enter in pursuit of the shooter. The incident commander, using location data and building layout information, directed the team's search. Location data was used to prevent redundant search patterns. The incident commander was able to track the responders as they approached the target. Although the search team converged within 1 foot of the target, they were confused because he was located inside a refrigerator. Tracking and location of the target was extremely accurate even through a concealed metal enclosure.

Frank from Sedona Systems on camera:
The refrigerator is all metal,
and you were able to see them walk by when they said they were on target, you say?

Police Cadet on camera:
Yeah. There was a crack in the ceiling so, yeah.
When I heard on the radio, you are on target, I saw.
Frank from Sedona Systems:
You could see them walk by.

Andy from Sedona Systems on camera:
Nice.
Well, keep in mind that the spec on our system is a 3 to 6 meter system. So I feel pretty good about the fact that people walked right by him,
and he was hidden in a refrigerator.

Narrator:
The second run intended to locate an active shooter hiding in the building. A search plan for the shooter's general location was drawn up at the base station. The plan was in the form of a serpentine route that would take the first officer through all of the conference rooms and hallways where the shooter would be located. Upon finding the shooter, she indicated the location of the shooter on her system and the location was transmitted back to the base station. A route was then planned for the second officer to reach the shooter without exposing himself. This route was automatically shared to the display of the second officer's system. The second officer followed the route to the location of the shooter at which time he and the other officer apprehended the shooter.

Ken from CHI Systems on camera:
She found the suspect.
She put the suspect's location in on her display. That came back here. We saw it here.
Based on the location, we were able to lay out a route for the second tactical team to go in and follow that route
so that we could prevent the guy from moving out the back side of the, through the hallways there.
So they went down the hallway over here. He had that route, and he tried to follow it as best as he could.

Conclusions:
1. In one instance, the search team was able to converge to the precise location of the shooter, even though he was hiding inside a metal refrigerator.
2. Initially the tracking location of both officers was not accurate. This was due to the failure to calibrate the systems prior to commencement of the exercise.
3. The Police Sergeant was able to monitor the action and location of all officers at all times. Voice contact was also maintained.
4. Both data and voice communications were strong throughout the exercise.

Another scenario at the convention center was conducted in the underground parking garage.
This exercise consisted of a hostage situation in which an officer was sent to locate the hostage and communicate the location.

The incident commander maintained situational awareness and helped the teams avoid known hazards using location data and communicated this via radio. The responder in pursuit was effectively tracked and it was even possible to determine if he was moving in right angles, left or right.

Narrator:
Next, one officer was sent into the parking structure to locate a downed officer. The base station, which was tracking the first officer on a map display, sent a route to the second officer display unit, who followed the route to the location. The officers then separated, but the base station tracked the new route and communicated it to the second officer who quickly found the new location.

Incident Commander on camera:
Obviously we were starting, our starting point was quite a bit further away than the previous test as well, and without any other support.
So that was pretty impressive.

Narrator:
Conclusions:
1. Accuracy for this exercise was much better primarily due to the calibration of the systems prior to the commencement of the exercise.
2. Situational awareness was excellent as the systems were able to seamlessly pass both data and voice communications.

A third location was the Vista Detention Center, a multi-level building with reinforced concrete walls, steel doors and lead lined windows. The scenario here involved a tunnel corridor rescue. With one of the testing technologies, communications was almost completely denied, even with the addition of

multiple relays. The second system also struggled to communicate accurate data between the rescue firefighter and the base station because of inaccurate calibration to the user and the lack of any type of building layout or blueprint. After repeated tries, the tests were terminated due to the harsh conditions, which did not allow for proper testing.

Conclusions:

1. The systems by themselves are not suitable to operate in such a harsh, fortress-like facility.
2. Detention centers such as this one would require proper communications infrastructure designed into their system.
3. Lack of calibration and adequate training impacted the performance and results.
4. The absence of a building layout impacted the performance and results.

Alex Nunes on camera:

The tests conducted here were designed by the first responder community to simulate the harshest environments that the first responder community has to deal with on a day in and day out basis. The tests conducted would indicate that given attention to several lessons learned, and given a suitable radio communication system, it is possible to operate under these severe conditions. The lessons learned include:

1. First responders must be trained to know when and how to use 3D location technology.
2. Manually placing repeaters to extend radio frequency is not practical in a real world scenario.
3. All 3D systems need to be calibrated to account for leg length either before or during a real world scenario.
4. And, 3D tracking in maze like environments would benefit from 3D blueprints.

Narration:

As a result of the lessons learned from these tests, it would appear that a 100% solution for personnel location may not be practical for first responders in the near term. However, a system that provides an 80 – 90% capability is very practical. CCAT’s next steps include the testing of these types of systems in environments which reflect the 90% capability. CCAT's focus is on the transitioning of DOD technology to the first responder market as soon as practical.