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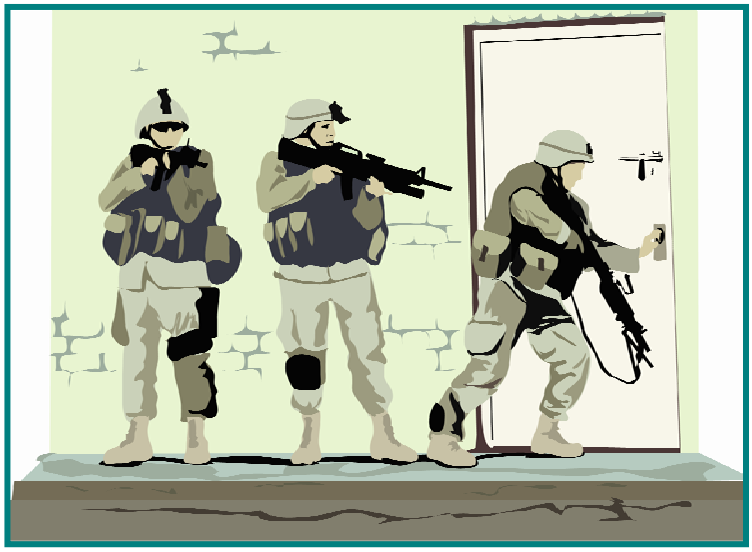
Assured Urban Operations

In the late stages of the Urban Combat Phase of an operation, our military forces are often operating at close quarters against an ambiguous enemy, and they have no reliable system to identify friends or foes to differentiate the bad guys from the good guys. This same problem of the ambiguous enemy exists in the Survivability and Sustained Operations (SASO) phase of the urban fight. In fact, the ability to target the bad guys and minimize collateral damage becomes even more important in the SASO Phase, when the ratio of good guys to bad guys increases dramatically. How can we help our military forces complete their military missions while ensuring the safety of the citizenry?

We can help by giving them the tools they need to achieve three important goals in the conduct of combat and SASO missions in the urban theater:

- Controlling the mobility of people and vehicles
- Conducting safer and more accurate raids on buildings
- Defeating improvised weapons



In each of these areas we are looking to you for ideas to revolutionize the way that we are doing things now.

Controlling the mobility of people and vehicles is key to controlling the enemy in the combat phase of the battle. It also provides a tool to control crowds and vehicles in the SASO phase of the mission. In the early stages of combat, we seek to demobilize all adversarial combatants. As the fight moves into urban areas, collateral damage associated with this type of approach is clearly unacceptable.

One approach to mobility control is the SPO Reversible Barrier (ReBar) Program. The broad agency announcement (BAA) for this program is currently open and the bidders conference begins on August 17. We are seeking to develop technologies and systems that will enable troops to almost instantaneously construct strong access barriers that can be rapidly reversed. This technology could be used to seal off the streets in an operational area to keep out unfriendlies. Reversing the barrier would allow friendly forces to come and go as needed. You can readily imagine other uses for this technology in both the combat and SASO phases of the battle. We are looking for proposals to help make this dream a reality.

What is another way to control mobility of combatants and non-combatants in the urban fight? How about slippery materials that inhibit people and vehicles from moving around and gaining access to sensitive or prohibited areas? And what if that material could also be controllably reversed? We have some initial ideas, such as Polymer Snow, that acts very much like real snow and which, like

real snow, will melt under the right conditions. We can cause it to snow, even in a climate like Iraq. However, we are looking for approaches that provide finer control of slipperiness, lower logistics burden, simpler delivery, easier clean-up, usefulness on all surface types, and longer duration.

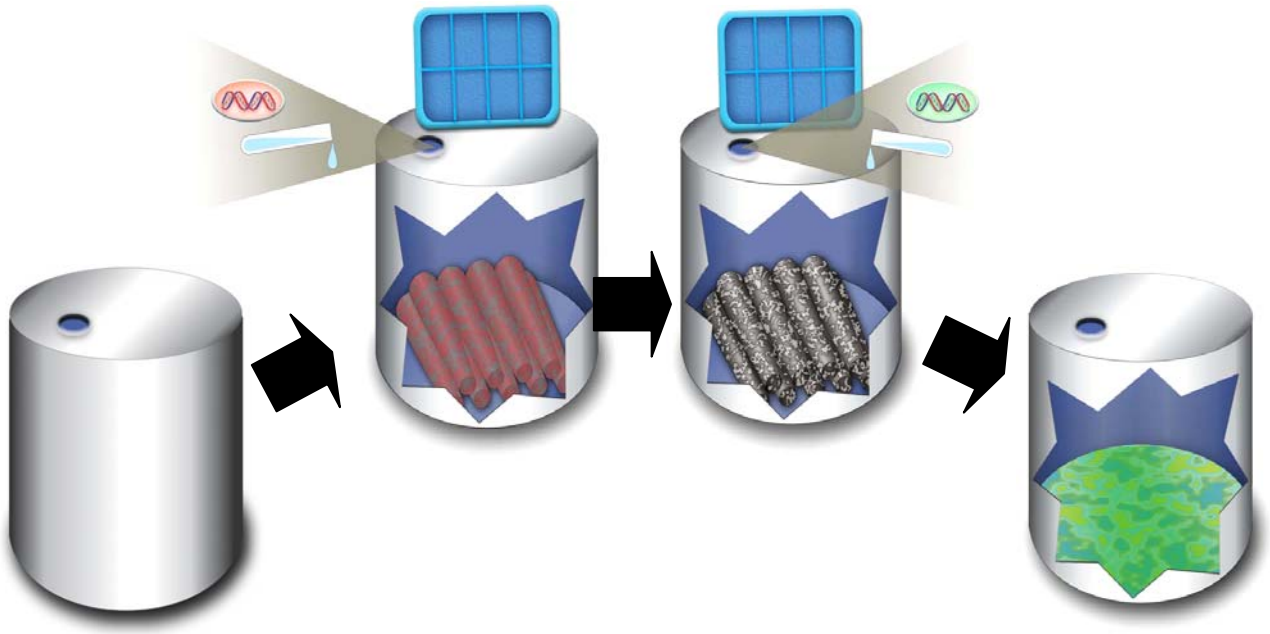
Another reality of urban combat is that, typically, enemy combatants don't stand out in the streets and face down our clearly superior firepower. Much more likely, the enemy uses buildings for protection, essentially creating urban fortresses. Raids on such facilities are extremely dangerous. We are interested in providing our warfighters with technologies that will enable them to get inside safely, and, once inside, quickly get to the people and weapons that are there.

Today, breaching an urban fortress is extremely dangerous to our Forces and to potential non-combatants inside the building. When we blast our way in, we have to stand back, out of harm's way. This slows down the operation and gives the enemy inside time to prepare and further entrench themselves. Obviously, the blast is also dangerous to anyone inside the building, not just enemy combatants. We are very interested in ideas on technologies that can breach structures without the unfocused overpressure of conventional explosives.

The last topic to cover is the defeat of improvised weapons. Enemies of the US and terrorists worldwide have been turning discarded munitions and other dangerous materials into effective weapons. These devices have had dramatic and deadly effects and their presence forces our personnel in urban combat zones to maintain a continuously heightened, and exhausting, state of alert. It is clearly counterproductive to use deadly force against every suspicious vehicle and person. So how do we stop the use of IEDs?

We could try to detect devices that are emplaced and ready to use, and we need to be able to do that. But, if we can take the fight deeper and move closer to the source, we can be much more effective. If we get the bomb, we have gotten one device. If we get the bomb factory and hopefully the skilled bomb-maker, we prevent many weapons from being built and deployed.

One way is to use those rapidly reversible barriers to restrict the enemy's urban mobility. Perhaps similar technologies could be employed to create impenetrable barriers that could keep munitions from being stolen out of known caches and storage facilities. These barriers could also be used to provide a mechanism for later opening the door and removing materials to be demilitarized. This would



be useful because the huge quantities of ordnance make rapid demilitarization with conventional technologies unfeasible.

What if we were able to use reversible barriers to create a reaction vessel for chemically or biologically demilitarizing the ordnance *in situ*. This would not have to be a rapid process. Even a technology requiring several months of reaction time would be a significant improvement, and SPO is eager to hear novel ideas along these lines.

What about unknown caches of weapons? How can we find, capture, and destroy these weapons caches and improvised bomb-making factories? What are some of the signatures that we might use to locate them? There is of course the signature of the explosive materials themselves. Can we somehow map the explosive material concentrations across a city and determine the hot spots? What sort of technologies could feed into such a system? How about a stand-off spectroscopic system to look for spectral signatures? Such devices could trigger investigations in hot locations. To make this approach work, we have to overcome interference from other chemicals in the environment, particularly since the vapor pressures of most explosives are quite low. Plus, clutter from large, known munitions sites could complicate accurate detection. Nevertheless, we believe that using molecular emissions from explosives is a promising approach for discovery of weapon caches and bomb factories.

How about using widely distributed point sensors to map out explosive vapor concentrations? These sensors can be much more specific than spectral techniques, although they are clearly not as fast and could be quite expensive. So the challenge is to employ the specificity and sensitivity of point sensors without breaking the bank with large-scale deployment. Perhaps we could distribute passive taggant materials or structures that integrate explosive concentration over time and can report that information when queried with some standoff asset such as a laser. Over time, this approach could provide a map of explosive concentrations and reveal weapons storage and construction sites. SPO wants to hear ideas in this area.

Explosives have to be transported to their targets. And we're looking for technologies and systems that can detect devices as they are being transported and deployed. Perhaps the standoff spectroscopic approach that was mentioned could detect a vehicle moving explosive materials. Such a system would be deployed as a standoff system at checkpoints that could provide detection without putting people at risk. Potentially, such a system could even detect explosive-laden vehicles on the move—an incredibly important development. Another option is to tag all vehicles passing through checkpoints with explosive detecting materials or structures and establish a network of sensors to read these tags. Once tagged, every time a vehicle passes a read-out device it would provide information about explosive materials it has encountered in its travels.

There are of course other ways of detecting vehicles transporting explosive devices that don't involve chemical signatures. One is chemical detection approaches.

Vehicles carrying large explosive loads will clearly have different mechanical dynamics than vehicles carrying lighter loads. Many of today's vehicle-born improvised explosive device (VBIEDs) outwardly look like the average car on the street but actually contain heavy loads of creatively cobbled-together mortar and artillery shells. Perhaps we could detect the additional weight from these heavy shells using structures like speed bumps, which help us to sense the vehicle's loading. We are interested in exploring such technologies – especially if they offer some technique for discriminating different types of loads.

Suppose we determine, by whatever means, that a vehicle is laden with explosives. What do we do? If we were absolutely certain that the vehicle is a VBIED, we stop it with deadly force. But what if the answer is less certain? A traction control

approach, like Polymer Snow, would provide a nonlethal alternative.

Preventing IEDs from being made is preferable to having to intercept or detect them. But until we have that capability, we must have reliable means for detecting deployed devices. And detecting emplaced IEDS is a DARPA-hard problem. Part of the reason is that it is so difficult to differentiate the chemical signature of an explosive from background clutter. An alternative would be to detect the metal objects in the IED. But here too, background clutter—in this case, structural and scrap metal in the urban environment—makes it extremely difficult. A potentially promising approach is the passive or active detection of the weapon trigger, whether RF or hard-wired. Again, SPO is intensely interested in ideas, particularly if they are coupled to a rational concept of operation.

These are the burning issues that absorb SPO today in the field of urban warfare: controlling the mobility of people and vehicles, enhancing raids on urban fortresses, and defeating IEDs in vehicles and along the roadside.

Of course, SPO's charter is to look ahead to the "future threat." And we are certain there are classes of improvised weapons that have not been encountered yet and which will someday be deployed against US Forces and our allies. We're doing our best to anticipate these threats, and interested in the view from your crystal ball as to what those threats might be, and how we can prepare to counter them. Our shared goal is to get ahead of the curve by providing new operational systems that will protect our warfighters far into the future, and save lives.