CENS INSIGHT

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Honey, I Shrunk the Terrorist: The Coming Role of Nanotechnology

"The role of the infinitely small is infinitely huge"
— Louis Pasteur

Electronically-driven information technology (IT) has been the focus for many counter-terrorism technologies. As a result of the electronic revolution that has caught the world's imagination, many assessments envisage IT as the future of counter-terrorism. It is worth noting, however, that such an outlook is primarily based on a linear approach. In other words, it assumes a continuous extrapolation of past trends.

The future of IT should be monitored, but in today's complex and uncertain environment, it may not be enough. It may be more effective to "scan the horizon" for alternative developments. So the question then becomes: Are there any other technological signals out there which may have potential long-term implications for counter-terrorism?

The answer is clearly yes. One such emerging, but often overlooked high potential issue, is nanotechnology.

Nanotechnology: A Primer

Nanotechnology or "small tech" as it is sometimes called, is the science of controlling atoms and molecules in the nanometer (1 billionth of a meter) scale to develop new materials that can have useful and unique properties. Unlike conventional manufacturing science which constructs things based on preexisting matter such as wood, metals and stones etc., nanotechnology looks at the possibility of starting literally from the bottom up to assemble an object atom by atom. And since it is the configuration of atoms and molecules in a substance that decides its attributes, the ability to arrange atoms on a nano-dimensional precision means that possibilities exist for new entities that can have wondrous functions.

Currently, nanotechnology is at the beginning of the applied research stage. Contemporary methods for manipulating atoms are crude, to say the least. While atoms can be moved, they are being transposed in mass. As one technologist puts it, "it is like making things out of LEGO blocks with boxing gloves on your hands". Despite the existing rudimentary standard, prospects of nanotechnology remain bright. Already, certain counter-terrorism applications can be gleaned from nanotechnology. Furthermore, scientists are estimating that it is only a matter of eight to ten years before the technology reaches mainstream maturity. Given all these, it is fair to say that nanotechnology will eventually become a major driver of in counter-terrorism.

Small Presence, Big Impact?

What are some of the ways in which "small tech" can contribute to counter-terrorism? Nanotechnology has the unique ability to create tools which are able to detect explosives that current X-ray and metal detectors miss. By creating special enzymes that can recognize certain explosive molecules, bombs may be critically detected much earlier. The first successes have already been reached. In June 2006, Professor Maher Kalaji of the University of Wales Bangor, created a detector which is capable of "sniffing" out very small traces of explosives in the atmosphere. Named the "nanodog", the detector is sensitive enough to even discern explosives with concentrations in the part-per-trillion range. Just imagine: if the "nanodog" can become ubiquitous in the same way as smoke detectors are in most buildings— terrorist bombing chances may be significantly reduced.

Nanotechnology can also be developed to detect chemical warfare agents such as nerve gas, sarin and mustard. In this connection, Professor Ken Klabunde of Nanoscale Materials, has developed nanoparticles which will not only be able to recognize deadly chemicals; it can also neutralize them instantaneously on the spot. Significantly, these nanoparticles are minute enough to be sprayed or used in an air filter, thereby leaving the possibility that it can be used to fortify air vent systems which are highly vulnerable to chemical terrorism. Meanwhile, Professor Klabunde has envisioned that future versions of these nanoparticles will even counteract biological agents such as viruses and anthrax.

Another possible application of nanotechnology is in counter-terrorism intelligence. In this respect, miniaturized sensors known as "smart dust" are being developed—which in its fully conceptualized form, will be able to form "clouds of eyes" that will be able to track and monitor activity. Because this "smart dust" will almost be invisible to human sight, the surveillance capability will constitute a quantum-leap in surveillance standards. Currently, the smallest conventional sensor is small, but still in the range of one centimeter in diameter— not exactly dust-like. However, with future advances in nanotechnology, it is envisaged that these sensors will eventually downsize enough to become "smart dust".

If a terrorist attack is to eventually happen, nanotechnology will also be able to serve valuable forensic functions. In what is known as the "lab-on-the–chip" concept, researchers are currently developing nanodevices which are capable of analyzing DNA samples within a matter of seconds, thereby providing counter-terrorism investigators with time-sensitive, after-attack evidence. With this kind of "small" edge, the lead time gained in establishing identity of the perpetrators will be crucial.

A Cautionary Note

Despite the inherent promise of nanotechnology, it is important to note that "small tech" is not the silver bullet of counter-terrorism— it is just a bullet. While nanotechnology can certainly create important counter-terrorism applications, it does not mean that terrorists or terrorism, will be eradicated. As strategist Colin Gray puts it aptly, "technology (and that includes nanotechnology) does not determine the outbreak, course and outcome of conflicts". Nanotechnology should not be hyped as a panacea of counter-terrorism.

Furthermore, a double-edged sword phenomenon exists for any new technology. In other words, nanotechnology can be utilized by the terrorists. When "small tech" becomes commercialized, who is to say that terrorists will not use it for their own purposes? In the same way the internet has been used by terrorists for their recruitment, communication and propaganda, nanotechnology may also be similarly exploited. One possible area of abuse is in the creation of a "nano-bomb". Explosives are more effective if the granular size of the particles involved can be made smaller, which increases the rate of oxidation of the explosive, rendering it more powerful. This methodology is already used by terrorists (and others) when they grind ammonium nitrate power down to a finer size in order to increase its explosive power. Doing this at the "nano level" would increase the power of some conventional explosives by an order of magnitude or more. Put simply, this means more bang for less size— a seductive proposition for terrorists. Indeed, the extent in which nanotechnology may be abused, is entirely up to the malevolent imagination of a terrorist.

As with any other technology, a race will exist to see who can more successfully exploit new technologies and ideas. Typically, smaller organizations that have a Darwinian imperative on them to survive have shown themselves to be better in this kind of exploitation. The current jihadist domination of the "battle space" of the Internet is a current example. If, however, governments are able to move quickly with the benefit of "horizon scanning" attitudes, nanotechnology may prove to be a key asset in counter terrorism operations and other forms of crime fighting.