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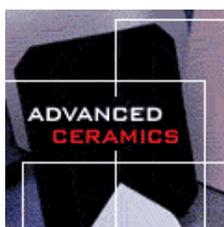
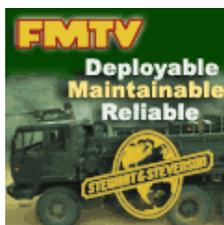
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## FEATURE ARTICLE

**March 2006**

### Directed Energy Weapons Face Hurdles

By STEW MAGNUSON

In an animated video shown by the Defense Department's office of force transformation, a team of Stryker vehicles tears through urban canyons on their way to rescue two downed helicopter pilots.

An insurgent first attempts to set off a roadside bomb through his cell phone, but a jammer blocks the signal. An angry mob then blocks a street, but a non-lethal active denial system using microwave millimeter technology along with a sonic blast pushes the crowd aside.



The Stryker vehicles arrive at the crash site, but are immediately ambushed by enemies firing rocket-propelled grenades. However, an automatic radar tracking and kinetic energy system both detonates the missiles in mid-air, and gives the crew coordinates of their launching points. The soldiers quickly return fire, and rescue the pilots.

It is the "Black Hawk Down" scenario — recognizable to anyone has seen the film or read the book based on the predicament of soldiers in Mogadishu — but this time with a happy ending.

The directed energy weapons used by the Stryker crews in the video are on the verge of being deployed. Some may reach Iraq and Afghanistan within this calendar year, but there are several hurdles program directors and policymakers must overcome if these new systems are to make an impact in urban battlefields. The biggest challenges will have little to do with the technology, the weapons' proponents admit.

Public perception, acceptance by battlefield commanders, and treaty, legal and policy concerns will have more to do with their success than the science that has gone into them, Defense Department officials said at an Institute for Defense and Government Advancement conference.

Brian Mork, a principal system engineer at Edwards Air Force Base's 412th Test Wing, said these weapons have undergone development for 30 years. "It's time to move it past just the technology demo and talk about how you stick this into the war."

Marine Corps Col. David Karcher, commander of the joint non-lethal weapons directorate, said few people inside and outside the military "inherently understand directed energy technology."

Northrop Grumman Corp. analyst Richard Dunn said the laser age is approaching much quicker than most in the Pentagon, Congress and the military war colleges realize. The company in January was awarded a 36-month, \$56-million contract to further develop a joint high power solid-state laser.

"We've got to develop a constituency, people who can grasp the potential of [this technology] and force us to have a discussion," he said.

Misperceptions on the part of the public, and the review boards that must approve these weapons, are merely one of the many hurdles. Board members come from all walks of life. For such weapons as the active denial system and airborne laser to gain acceptance, the military must address the "death ray" perception associated with laser technologies.

For example, an inevitable question for non-lethal weapons targeting people will be what happens to

women who might be pregnant? Conspiracy theorists may claim the United States is deploying technology to sterilize men or women. Will the technology cause skin cancer or birth defects?

“For the non-lethal side, since we’re directly targeting people, we have to answer that,” Karcher said.

In addition to being scrutinized by review boards, the weapons must gain legal and treaty clearances to ensure they meet the laws of armed conflict. Laser dazzlers — a bright light designed to warn drivers in civilian vehicles away from approaching convoys or roadblocks — and the active denial system, which uses microwave millimeter technology to control mobs, are non-lethal weapons designed to reduce casualties. Even though they’re designed as alternatives to lethal weapons such as bombs or bullets, they must pass internationally recognized definitions of humaneness, Karcher said.

The United Nations convention on conventional weapons has a blinding laser protocol, which prohibits weapons specifically designed to cause permanent blindness.

Policy and fiscal issues will also need to be debated in Washington, Karcher said. Meanwhile, there are a host of unanswered questions on employing these new technologies on the battlefield. Acceptance by battlefield commanders is key.

“Transformation is not easy. It causes a lot of teeth grinding, dirt kicking and spitting on the ground,” said Col. Wade Hall, program director for project Sheriff, the Stryker vehicle depicted in the “Black Hawk Down” scenario.

Sheriff is among the vanguard of directed energy systems undergoing final testing. Pending approval, the vehicles could reach Iraq this year, although there is no firm deadline, Hall said.

Kevin Montoya, directed energy test and evaluation manager, 412th Test Wing at Edwards Air Force Base, said commanders on the ground will not be familiar with the new weapons. Some may feel threatened if they believe the systems are there to replace their tried-and-true conventional firearms. Officers should be made to understand that the weapons are there to supplement, rather than replace.

A new cadre of directed-energy operators, everyone from “wrench-turners to policymakers” needs to start putting the message out. Tactics, concept of operations, and when and how to use the weapons must be discussed, Montoya said.

A pilot Montoya’s office briefed on the airborne laser stated bluntly that at the end of the day, he’d rather have the capacity for another 1,000 pounds of fuel.

“That’s an example of us not doing a good job of knowing where he’s coming from,” Montoya said.

Karcher said there are currently more questions than answers on integrating the weapons into the ongoing conflicts. How will they fit into existing doctrine? Which commanding officer is going to say “yes” to using a high powered microwave? When can it be employed? Can the decision be made quickly enough for it to be effective?

If a system designed to detonate roadside bombs happens to permanently damage every home computer in an Iraqi neighborhood, is the military going to step in and provide restitution? These are questions that must be asked, Karcher said.

An often overlooked complication concerning the new suite of weapons will be battlefield damage assessment, said Mork. Weapons directed at buildings, computer systems or vehicles pose new problems. Traditionally, damage assessment has been done in a “shoot-look, shoot-again-if-needed” mode. “We break the bridge; everybody knows the bridge is broken,” he said, but directed energy weapons will often cause invisible damage requiring a new type of intelligence gathering.

An airborne electronic warfare weapon, for example, may target an enemy’s command center computers. The effect could spark a temporary outage, and the enemy may never realize he was under attack.

An enemy tank or vehicle may be able to keep moving forward even after an advanced tactical laser knocks out its weapon systems. To a soldier, the tank may still appear to be a threat. How does a battlefield commander assess damage from weapons designed to penetrate inside a building or armor and

cause invisible damage, Mork asked.

“Battlefield commanders don’t want this guessing game. They want a predictable weapon ... This is a problem,” Mork said.

The intelligence community and engineers designing the systems must share this burden, he added.

Karcher said despite the many unanswered questions, the payoff could have an important impact in the urban battle zones of Iraq and Afghanistan.

“We do believe directed energy is a big bet, but it’s well worth making,” he said.

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