c|net NEWS.COM http://www.news.com/

High tech's slow march in land mine campaign

By Jonathan Skillings
http://news.com.com/High+techs+slow+march+in+land+mine+campaign/2100-1008_3-6092261.html

Story last modified Tue Jul 11 07:57:21 PDT 2006

The search for land mines is not something done in haste. Nor, as it turns out, is the search for new technology that could be used to find mines.

Despite a lot of promises about high-tech advances, people working in land mine clearance are using technology that hasn't changed dramatically since the Second World War. And a lot of them say that--given the risks of using technology that's still in its shakeout period--they'd just as soon stick with the tried-and-true.

"We need more of what we know works, rather than new technologies," said Noel Mulliner, technology coordinator for the U.N. Mine Action Service. "New technology is not going to get into the field fast enough. We want more of the simple stuff."

Land mines are a serious problem in many countries, from postconflict places like Bosnia to simmering trouble spots such as Afghanistan and Sri Lanka. Along with unexploded hand grenades, mortar rounds and artillery submunitions, they are a potentially deadly litter from battle and can persist often many years after a cease-fire has been reached. Casualties run into the tens of thousands a year, according to estimates.

Over the years, there's been no shortage of clever ideas for finding and eliminating mines, from training bees and rats to sniff out explosives to using lasers to detonate mines and other ordnance. The problem is that those that aren't completely far-fetched can take too long to get off the drawing board or cost too much for cash-strapped humanitarian demining operations.

The most promising advance, just now getting into the field, involves a variation on the common metal detector--combining it with ground-penetrating radar into a multisensor system called HSTAMIDS. The U.S. military has been using it for a couple of years in Iraq and Afghanistan, and a version for civilian use is going through trials.

Other, more mundane forms of high tech, such as Internet hookups and Google Earth, are also starting to find more widespread use in the field of humanitarian demining. They can be of help in the remote areas typically targeted in efforts by civilian and nongovernmental organizations to remove land mines from former battle zones.

The goal here isn't a military one, with an army trying to speed from one point to another across defensive positions and under fire from an enemy force. Rather, it's an effort--at once global and local--to return communities to normal life, so that civilians can go about their daily business of raising crops, accessing potable water, taking goods to markets and just letting children out to play.

"It doesn't take too many mines to keep people from using a road," said Al Carruthers, technology

officer for the Geneva International Centre for Humanitarian Demining.

Counting the cost

Precise numbers of victims are hard to come by. The best estimate by Landmine Monitor, the reporting arm of the International Committee to Ban Landmines, is that there are between 15,000 and 20,000 new casualties each year; in the 2004-2005 reporting period, those injuries occurred in 58 countries.

It's not just fatalities that are a concern. Antipersonnel land mines tend to be designed to maim, rather than kill, resulting in the loss of a foot or a hand, or some other debilitating wound.

Scent of a mine

When metal detectors can't give a precise reading of what's in the ground, send in the dogs. Or the bees.

Read about alternatives to detectors here

The exact number of land mines is also elusive, with worldwide figures ranging well into the millions. On the positive side, it appears that fewer are now going into the ground than are coming out, but the problem of clearance remains a daunting one.

Often, the countries most in need of assistance are those facing significant financial problems--they're developing economies further weighed down by the overall costs of recovering from war. Because they don't have a lot of money to spend, they're not the most promising customers for companies that build gear such as chemical sensors and armor-plated trucks. Instead, those companies tend to focus on military buyers, and the R&D and resulting equipment may later trickle down to nonmilitary groups.

"There's a much higher priority for people who have big bucks," Mulliner said.

In addition, demining gear has to be tough enough for sometimes rough handling in rugged terrain and a variety of climates, from rocky mountains to dense forests.

So while there's great promise in some high-tech options, said Dennis Barlow, director of the Mine Action Information Center at James Madison University, "generally, the greater promise...is still going to be whether (demining) can be done in a low-cost, low-tech way."

Right now, the most common machinery for finding land mines is the metal detector, swept back and forth in a slow and painstaking trek across suspect terrain. The deminers then get down on their hands and knees to gently probe the ground and scrape away the soil. Explosives-sniffing dogs are sometimes used to find mines at the outset, but they're still a relative rarity and more often are used in a quality assurance role after a sweep.

"What works today in land mines is lots of metal detectors," Mulliner said.

What they find, however, isn't always a land mine, or any other explosive. That's because the metal detectors live up to their name, pinging whenever they come across a wide range of metal objects. On a former battlefield, that can mean a lot of noise from harmless shell fragments, vehicle parts and other military gear. And in some areas, villagers have been known to use mine fields as dumps, meaning a ping could as easily be from an old nail as a land mine.

Metal detectors also have to contend with variations in soil content, humidity and other factors.

One tool that is helping to distinguish mines from clutter is HSTAMIDS, short for "handheld standoff mine detection system," which was developed by the U.S. Army in a research project reaching back into the mid-1990s.

Listening and looking

HSTAMIDS is a dual-sensor system. Its electromagnetic induction metal detector listens for echoes

from a mine's metal casing or components, while its ground-penetrating radar, or GPR, looks at the shape of objects below the ground. Software helps compensate for ground conditions.

Most of the time, an operator "is going to hear a metal signature, then see if he can get a consistent GPR return," said Bob Doheny, a Department of Defense official focused on special operations and low-intensity conflict.

The civilian version of the system is undergoing long-term evaluation in Cambodia, Thailand and Afghanistan. In Cambodia, where testing began in April, the speed of detection using HSTAMIDS is nearly six times that of a metal detector by itself, primarily because of the ability to discriminate clutter, Doheny said.

"That will greatly assist the human deminer in speeding up his clearance process, because he will not have to dig up 10, 20, 30 pieces of metal for each mine he clears," the U.N.'s Mulliner said.

But it's not cheap. In high-volume production, the military version costs about $17,000 apiece. That version has features that humanitarian deminers wouldn't need, including the ability to work underwater and at night, and to be dropped by parachute from an airplane. "We're not sure what a pure demining version would cost," Doheny said. "We're working to make it more affordable."

By contrast, standard metal detectors cost between about $2,000 and $5,000 each.

The metal detector used in HSTAMIDS is the MineLab model F3, originally developed and proven for gold mining, which is one of a new generation of ground-compensating devices that can cancel the influence of electromagnetic soil. It gets good marks in its own right, but like all gear redeployed to hunt for land mines, it had to go through a transition period.

"The major challenge with making this machine (the F3) most useful for demining was in making it easy to operate and durable enough to withstand almost continual use by unsophisticated operators. The technology was already there and proven, but the packaging had to be realistic for the context in which it would be used," Andy Smith, an independent consultant who has worked with the U.S. government, the U.N. Mine Action Service and the GICHD, wrote in an e-mail.

Smith offers a cautionary note about HSTAMIDS: "With small antipersonnel mines, in rocky ground with trees, roots and very wet or very dry areas, the GPR is unreliable. A deminer who relied on its readout would be gambling." The system, he wrote, "could make demining faster--which can be very important for a soldier under fire--but only by increasing the risk of leaving something behind."

The Defense Department's Doheny says those working with the system are getting a thorough introduction that targets 15 types of mines, including low-metallic ones, and both antipersonnel and antitank ones.

"After about 10 days of training, they're very good," he said. "If there's any question with the GPR that it might be a mine...we call it a mine. We don't want any false negatives."

Low-metal sniffer

A self-propelled GPR system that's designed to find low-metal antitank mines is the MineStalker, from a company called Niitek. The device also promises to find those that are buried deeper and are tougher to find with a metal detector. It's been tested in Angola and Namibia.

Slow and steady probing isn't the only way to deal with a known or suspected minefield. It can also be pummeled or plowed by heavy equipment. Some demining programs, including the one in Croatia, have made a big investment in armor-plated mechanical gear such as tillers and flails. This is expensive

equipment, with prices ranging from $100,000 to $1.5 million.

Even the best of those devices, though, can't be guaranteed to find all the land mines, and it's 100 percent elimination that's the goal of humanitarian demining. The big machines are relatively crude tools that still require people to go in to do quality checks--and further digging.

"No one is yet happy that a machine is capable of clearing an area," Mulliner of the U.N. Mine Action Service said. "Machines are used because of a low threat in the area. Machines are never used in a primary role of clearing yet."

Meanwhile, demining teams in the field are starting to make more thorough use of GPS tools, geographical information systems and satellite imagery for scoping out areas and recording their findings.

"I used Google Earth to look at a mined area in the desert recently and could see that there were many burned-out vehicle wrecks in the area--which means that I know I will need to take machines to move those and may need to deploy extra skills to deal with the damaged ammunition that may be in them," Smith wrote.

But that just gives an overall sense of an area. It doesn't begin to pinpoint the actual mines, which brings things back to metal detectors and HSTAMIDS.

"The key to the whole thing is detection. In the demining world, if you can find it, you can deal with it," Carruthers said. "There isn't anything in the next couple years that's going to happen except multisensor (technology)."