

CONQUERING THE INSURMOUNTABLE

The Canadian Center for Mine Action Technologies Advances the Technological Realm of Demining



by Stephanie Schlosser and Virginia Saulnier, MAIC

The Canadian Center for Mine Action Technologies (CCMAT) is a partnership of resources from the Department of National Defense and Industry Canada. The Center is co-located with the Defense Research Establishment Suffield (DRES) at Canadian Force Base Suffield in Alberta.

CCMAT's mission is to conduct research and development of low cost, sustainable technologies for mine detection, mine neutralization, personal protection and victim assistance. The center also seeks to find alternatives to anti-personnel landmines and serve as an information hub on humanitarian demining technologies. CCMAT is a test and evaluation site for new ideas brought forward by the Canadian Industry and its partners.

After the CCMAT was established in August 1998, Dr. Denis Bergeron quickly assumed an active role within the center. Previously, Dr. Bergeron's background at DRES had directed his focus to the neutralization of landmines; however, his interest has

since shifted to the protection of deminers against exploding landmines. During an interview with the Journal, Dr. Bergeron offered candid responses concerning CCMAT's main objectives, their current products and their vision for the future.

Communication Venues

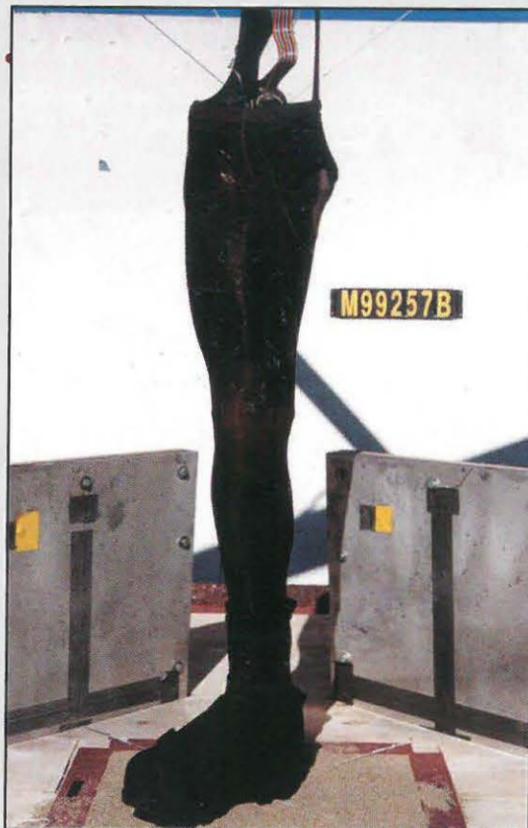
Dr. Bergeron spoke extensively of the flowing web of communication present in the demining community, especially between Canada and the United States with respect to SOLIC and Fort Belvoir, Virginia, and the European demining organizations. "It's been excellent cooperation on that side [Fort Belvoir]. There's also quite a bit of cooperation with the European community... There is a very frequent exchange of information, keeping each other aware [of] the progress." Maintaining open communication is vital to the advancement of demining technologies, as "there isn't enough money to try everything... and certainly you don't want to quench any of the ideas that are coming out. However, you have to be selective as to pursuing which ones will actually make a difference in the field."

Despite the traditional image of static think tanks and endless facts and figures, technology is a creative activity that only grows when one new invention spurs on the thought process of another developer.

The Demining Technologies Information Forum

To reinforce the open exchange of ideas among the demining R&D world, one of CCMAT's newest initiatives is to start a Demining Technologies Information Forum (DTIF). With new developments in mine action technology as a major part of the CCMAT mission, a way to share those innovations is paramount to the center's success and effectiveness. There is a need among scientists, engineers and all R&D to advance demining technologies and to share information in an organized way. Some key players in DTIF would be the European Union, United States and Canada. The sharing of even the simplest idea to the most technologically complex will create an auger for advancements in mine action technologies that contributes to the world's efforts to remove landmines.

DTIF will be a forum for R&D people involved in technical demining and will be open to all countries, especially those with a funded R&D demining program. For DTIF to carry on its work in the most productive format, CCMAT has outlined several of its qualities. DTIF will keep the technology world updated on the state of funded research in national programs. Additionally, DTIF will develop meetings,



With the creation of the FSL, engineers and scientists can measure a human leg's reaction to an exploding mine.
Photo c/o CCMAT

workshops and a universally accessible web site, and employees will publish an electronic journal dedicated to R&D demining. DTIF will be implemented through the JMU/MAIC web site, through a demining technology journal, newsletters or other suitable publications, and it will conduct workshops on specific topics. The first conference was held in Ispra, Italy, in July 2000. Essentially, DTIF will succeed in supplying a medium conducive to the free sharing of technological theories, assisting the flow of uninhibited communication.

New Technologies

As one of CCMAT's prime objectives focuses on innovative demining techniques, applying military countermining technology to humanitarian demining seems only logical. Therefore, the collaboration with other organizations assists CCMAT's attainment of this goal in addition to maximizing the efficiency of a combination of resources. Dr. Bergeron supports this objective, as "technology remains technology... the physics are what drives the [landmine] problem and what will drive us toward a solution." Although military countermining technology specifically applies to the speedy detection and neutralization of ordnance under combative conditions, the application of military intelligence to humanitarian demining demands attention. "[Demining] can bring the technologies that would not fit the time schedule for countermining and use them in humanitarian demining," effectively demonstrating the potential benefits resulting from collaborative efforts.

The Frangible Surrogate Leg

Because most victims of landmines detonate the bombs when they step on them, the feet and legs are usually the first body parts to feel the terrible impact. In order to test safety equipment for deminers, CCMAT must have a tool to simulate the deminers' limbs and, therefore, give accurate readings on the effectiveness of a given tool. Hence, engineers and scientists invented the Frangible Surrogate Leg (FSL). The FSL is a particularly positive example of the demining community's coordinated endeavors. This new technology, developed by Australian scientists at the Defense Science and Technology Organization and the University of Adelaide, allows the center to facilitate the design, development and evaluation of new protective clothing and equipment for deminers.

The FSL is a precise reproduction of the human leg made with materials that react to a blast as human tissue would. "It has advantages over donated

limbs...from people who have had gangrene or something, [because] those limbs have disease so the results are biased. If the subject is a twenty-year-old, there is a certain strength in the bone [as compared to a sixty-year-old]; therefore, in trying to compare tests ..., you are not working from the same sheet." Consequently, the FSL's likeness to a human limb is what makes it so vital to deminers' safety. The bones are made of mineralized plastic, and ballistic gelatin represents the muscles.

After the FSL receives the impact from a simulated AP mine, strain gauges placed on the bones measure the load imposed by the blast, and an X-ray sensitive dye allows surgeons to use the CT scan for diagnosis. The CT scan produces a three-dimensional image that allows non-medical personnel, such as the designers of protective equipment, to interpret blast injuries and create better protective equipment. By understanding the physics of a mine blast, as it pertains to lower leg injury, equipment designers can better serve deminers in the field. The FSL can help with the evaluation of prototypes and new designs at their earliest stages.

The Spider Boot

An example of one of the benefits resulting from the application of the FSL to demining safety concerns is the Spider Boot. The boot, which is intended to protect deminers' feet if they should detonate a landmine, looks like a chic hiking boot on top of a tabletop-like platform complete with four "legs." The developers of the Spider Boot, Med-Eng Systems Inc. in Ottawa, worked with the help of a Defense Industrial grant to develop this foot-protection tool. By testing the boot, CCMAT fulfills its mandate to adapt military technologies for application to humanitarian demining.

The Spider Boot's futuristic look does not make it at all a playful toy or inventor's fluff. It is, rather, a potential life- and limb-saving piece of footwear. The idea behind the Spider Boot is that it keeps the foot at a safe standoff distance from the blast origin. The Spider Boot provides more protection than a conventional mine boot by deflecting away decaying blast waves and by absorbing the residual energy with the composite materials of the boot. Field trials at CCMAT have shown that the energy-absorbing materials in conventional boots cannot withstand the overpressure of the detonation.

As with any new piece of equipment, skepticism is bound to surface, but, as Dr. Bergeron stated, "People in the field are skeptical, and they should be

because they're the ones whose lives are on the line. The equipment is there to protect [deminers], provided [they] use it in a certain manner." In addition, Dr. Bergeron asserted that demining organizations must not blindly purchase equipment for their employees, but research the benefits from proper use of the equipment and the consequences resulting from improper use. "That's part of the testing too, so you can provide people with an example," Dr. Bergeron acknowledged, referring to the testing of the FSL.

CCMAT's Vision for the Future

In conclusion, CCMAT's vision for the future must coincide with their current direction to position themselves to further improve deminers' personal protective equipment and clothing. Dr. Bergeron summarized, "I think what's important within CCMAT is that we are taking a step in the right direction, one that's improving a lot on the safety of [deminers]. ... And, like anybody who works in this domain, you want to see the work that you do be put to good use. That's what we're hoping for. I think we are very much in line with meeting that goal. You always want to leave a legacy behind [and know] that you've done a good piece of work that's useful to people." ■

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During the past year, the CCMAT has carried out testing to evaluate the Spider Boot, a radically new foot protection system against anti-personnel (AP) mines.

Photo c/o CCMAT