Technology and its Use in the Mine Field

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Technology and its Use in the Mine Field

Canadian Center for Mine Action Technologies (CCMAT) outlines a cycle of development and testing which should help more useful technologies make it to mine fields. In this article, three products are introduced that successfully follow this cycle.

by Geoff Coley, Canadian Center For Mine Action Technologies (CCMAT)

"Technology Has Not Delivered!"

A great rallying cry perhaps, but a misguided one. Of course technology has not delivered. Technology must be delivered. But before you dismiss this as mere semantics, consider that technology and demining (but not always) been addressed in one of three ways:

• Someone comes up with an idea and develops it to death only to find that the problem that is supposed to be solved does not actually exist.

• Someone comes up with an idea and flings it untested and unproven into the field somewhere. Often it is somewhere completely inappropriate. When it does not work, it is run testing in a compound.

• Someone comes up with an idea, researches it to death, and then it languishes in a lab because no one has any idea how to get it into the field.

Very seldom has technology been inserted into the mine field in a way that investigates the needs of the deminers, tests (and proves) the idea in a useful, realistic way and excors the idea into the real world. There are examples of good execution, but there are many more examples of poor execution. In addition, we tend to think of technology only as the starting new, never-before-seen high-tech widgets that solve all our problems with a wave of the hand. It is not technology we should blame; it is the deliv­ ery model that has failed.

Rubbish, you say! How about a few examples where technology has been successfully delivered? Where would today’s deminers be without standard military detection tech­ nology? While today’s versions are essentially refinements of an old idea, some of today’s models may be found ahead of what everyone wants a quick, easy fix to the problem of detection with new technologies. Detection is an immensely difficult problem. In many cases there is no easy, quick solution. Great strides have been made in the past few years in a number of detection fields. One of these advances has been the elimination of certain impractical avenues. There are a few detection technologies that are now re­ markably successful at finding buried mines. The problem is that they are also remarkably effective at finding other things leading to too many false alarms. The technology has not delivered! How many military detectors find only mines with no false alarms? Has that technology failed to deliver? Are we prepared to stop using military detectors? More diffi­ cult problems will be more difficult to solve but may yield more significant ad­ vances if they are not cut off prematurely.

So has there one old technology that was successfully delivered, and some new ones that we should patiently wait for, as they may eventually emerge? That is the only question that needs to be answered; we need no examples of successfully delivered­ delivered technologies! How about three examples?

Delivering Technology: Three Examples

CCMAT, a Canadian government organization, has been active for just over three years in the research, development and delivery of technologies for mine se­

This basic first step—examining what the users need and what they have the ability to provide—is often overlooked in the eagerness to leap right into an exciting development program. This is the source of machines that work nicely on a large billboard trash but get stuck against the first rock they encounter.

Mechanical Mine Field Equipment Technology

One of the areas CCMAT chose to address was the test and evaluation of mechanical equipment for ground preparation. Rather than simply selecting a number of similar machines (flails, for example), CCMAT chose four com­pletely different types of equipment. A realistic area was developed that did not represent every possible environ­ment, but gave credible, repeatable and realistic (if limited) test conditions. Recognizing the difficulties that accompany testing with real landmines, CCMAT developed inert but highly realistic "me­chanical reproduction mines." Thus, CCMAT was able to safely and effectively test each of the machines against hun­dreds of realistic targets in scientifically controlled but representative conditions. Machines that performed well enough might be taken further along the track toward the mine field. It is also very important to have the testing done or rec­ognized by an interested third party. The data is only credible when there is no conflict of interest, and CCMAT had no stake whatsoever in any of the machines that would be tested.

Four machines were selected for the first iteration of the project. Each was provided with some development funding to bring it to the point where its po­tential could be evaluated. Of the four machines, one was eliminated in the ear­liest stages of testing. This was consid­ered a success; machines that are inca­pable of performing the desired task should be filtered out long before they are sent into a mine field and before they have extensive development funds as­signed. Two other machines performed better but not well enough to consider further development or testing. One machine—ProMac BDM48—was found to perform extremely well.

The ProMac BDM48 managed to destroy over 99 percent of the mechan­i­cal reproduction mines in its test pro­gram. While this result was exceptional, it was not considered adequate proof. After all, these were not real mines, and the test environment was not representa­tive of more than a certain subset of real mine field conditions.

A location was selected for further testing in the real world. Mounted on a hydraulic track, the BDM48 system would require certain logistical support, so certain parts of the world were easily eliminated as potential test sites. The Thai­land Mine Action Center (TMAC), having existing contacts with CCMAT allowed the arrangement of in-theatre testing at a location well-equipped to handle equipment of this type.

Before real mines and real mine fields could be tackled, however, the CCMAT process ensured that the system, and more importantly, the technology was de­finitely protected from the hazards of a mine field. Consultations with TMAC revealed the line of threats that might be encountered in the intended area. This list, which included blast and fragment­ation mines, AT mines, artillery shells and a range of other UNO, was used to specify an armor requirement for the BDM48. Test pieces of armor were subject­ed to artillery shell blasts, while the entire system was tested against a variety of other threats. An instrumented Hybrid III mannequin in the vehicle demon­strated that the operator would be safe. All of this was accomplished before the system ever left CCMAT.

Arrived with the extensive test results, including (perhaps especially) the armor protection tests, CCMAT team was able to sit face-to-face with the TMAC people and confidently discuss the pro­posed in-theatre tests. One of the critical parts of this section of the CCMAT pro­gram was the use of intentionally planted mines in the mine field. Ensuring a known number and type of targets in known conditions, meaningful results could be obtained quickly and efficiently. Randomly applying a machine over a suspected mine field would only have ensured random results. What would a blast mean? Was it a piece of UNO? A

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testing and adequate "field" testing to make sure you have credible results. Make sure the data is not tainted by any real or perceived conflict of interest. Find the right place and the right contacts for real-world trials. Make sure the system and humans are properly protected from the hazards of mine fields. Make the connections with potential donors. All will be left behind you. Once you arrive at the mine field, involve the Mine Action Center (MAC) people. Confirm your previous data. Get controlled live data. Be sure the data is still untainted. Complete the connection between the users and the donors. Technology delivered.

Victim Assistance Technology

Finally, let us examine a work-in-progress. CCMA is involved in the development, test and evaluation of new technology to assist the victims of land mines. CCMA has developed a system called Demolition Material Technology that in situ detonation of landmines should be a relatively simple matter. Identify the mine. Place an explosive charge. Blow it up. Simple. What is there to improve about the technology? How about making it cheaper? How about making the charge easier to ship and store? How about making the charge less prone to disappearance and misuse? After working on a research program for the Canadian government, MREL came up with FIXOR, a novel demolition explosive. They had a solution, but was there a problem? Along with MREL's other research, CCMA helped to ensure that there was, in fact, a niche that FIXOR might fill. For its own part, CCMA could provide help with test and evaluation and with the development of SOSs (assuming successful test and evaluation). Again, the whole process had to be considered for the successful delivery of the technology; identify with users' needs, develop prototype, test, extract it into the field for real-world testing and finally, link up with a donor.

After testing FIXOR against a variety of targets at MREL and CCMA facilities, CCMA made arrangements through its contacts in Kosovo to bring the system to the field for further testing. Controlled tests done in cooperation with the UN Mine Action Coordination Center ultimately resulted in a detonation of several thousand charges, FIXOR has since been provided to demining operations in Congo, Ethiopia, Eritrea, Mozambique, Cambodia, Zambia and Thailand. Technology delivered.

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References

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Get the user involved at the start—what do they need? Decide what you can do. Get potential donors involved. Do controlled testing. Do testing with the users. Complete the loop by connecting the users and the donors. And always make sure that your data is not contaminated by real (or perceived) conflict of interest.

There is one final failure in the successful transition of technology into the mine fields. The technology designed and manufactured by the labs and the companies often cannot figure out what they are shooting for. In June 2001, CCMA sponsored a conference that attempted to address this very issue. Improved mechanisms for information exchange are being developed but they will only work if both sides participate. The technology developers have to present their information and seek out the participation of suitable end-users. Meanwhile, the user community needs to present both its needs and the results of the field work on a regular basis. Only when both sides commit to an ongoing effective information exchange will we overcome this final hurdle.

Can technology deliver? No. But technology can be delivered. CCMA's program is one example of how it can work.

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Coley: Technology and its Use in the Mine Field

NOTES FROM THE FIELD

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There is one final failure in the successful insertion of technology into the mine field: the failure to communicate. The labs and the manufacturers often fail to get their message across and the end-user community remains unaware of what new or improved technologies are out there. Just as importantly, the end users often fail to communicate their needs to the manufacturers. CCMAT is helping to correct this.

*All photos courtesy of the author

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There are certainly other ways that technology can be successfully delivered. The key to success, however, is the same:

• Have clear goals and realistic expectations.
• Involve the user early in the process.
• Communicate effectively with the user.
• Be patient and persistent.
• Keep the user involved throughout the project.
• Recognize and appreciate the user's expertise.
• Maintain a positive attitude.
• Keep a sense of humor.

The ultimate success of technology in the mine field depends on the user's ability to adapt and use the technology in their everyday lives. The user must be able to understand and accept the technology, and be willing to invest the time and effort necessary to learn how to use it.

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With different motivations and different aims and modes and tools into a unit in which all are not identical, but all are in synchronization. Not only does the manager have to integrate the varying skills and mind-sets of his crew and supporters, but he also has to plan and carry out a system of rewards, punishments, and incentives of a different kind for a job well done. I am reminded of a saying, which I think is quite true and which unfortunately, is too often heard, that laisons that a typical project will, "punish the innocent, reward the guilty, and promote the non-participant." Would it be wonderful if we could actually turn this phrase on its head and see it as the basic, the true, the real, but that is no matter how well-built the device, how smooth the logicics, how precise the GPS, how generous the donor, how far the standard...