April 2002

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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 have generally (but not always) existed. But before you dismiss this as mere semantics, consider that technology and demining have generally (but not always) existed. But before you dismiss this as mere semantics, consider that technology and demining have generally (but not always) existed. But before you dismiss this as mere semantics, consider that technology and demining have generally (but not always) existed. But before you dismiss this as mere semantics, consider that technology and demining have generally (but not always) existed.

"Examples"

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 (flats, for example), CCMAT chose four completely different types of equipment. A huge body of opinion said that real minefield testing would not represent existing equipment, but gave credible, repeatable and realistic (if limited) test conditions. Recognizing the difficulties that accompany testing with real landmines, CCMAT was able to safely and effectively test each of the machines against hundreds of realistic targets in scientifically controlled or representative conditions.

Conclusions from 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 threats, was used to specify an armament requirement for the BDM48. Test pieces of armor were subject to artillery shell bursts, 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.

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 minefield conditions.

A location was selected for further testing in the real world. Mounted on a hydraulic track base, 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 minefields could be tackled, however, the CCMAT process ensured that the system, and more importantly, the mine exploder, would be properly 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 UNOs, was used to specify an armament requirement for the BDM48. Test pieces of armor were subject to artillery shell bursts, 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, the CCMAT team was able to sit face-to-face with the TMAC people and confidently discuss the prepared 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 UXO? A
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 integration of technology into the mine fields: the field for further testing. The labs and the manufacturers often fail to get their message across and the end-user community remains unaware of what new or improved technology is out there. Just as importantly, the end users often fail to communicate their needs except in general terms. The labs and the companies often cannot figure out what they are shooting for. In June 2001, CCMAT 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 for further testing. 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. CCMAT's program is one example of how it can work.

All photos courtesy of the author.

References

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From the Director's Desk continued from page 122
With CCMAT's assistance, NPO has been developing and testing the Niagara Foot in controlled laboratory conditions. The key to ensuring that technology does get delivered is that you must completely close the loop. Find out what the users need. Decide what you (realistically) have the ability to do. Do the laboratory level 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 before you leave home. Once you arrive at the mine field, involve the Mine Action Group (MAG) 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.

Demolition Material Technology
In-vivo demolition 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 change 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 they had also to plan and carry out a system of rewards, punishments, and incentives for the development of a job well done. We are reminded of a saying that the cynics often use (and which unfortunately, is too often true), that lamons that a typical project will, "punish the innocent, reward the guilty, and promote the non-participant." Would it not be wonderful if we could actually turn this phrase on its head and see it so that the honest, the steadfast and the patient are not only honored, recognized, or rewarded? Nearly everyone, regardless of motivation, appreciates recognition. The smart manager will give great attention to identifying and paying tribute to his subordinates.

The premise for this column is that focusing on basic human attributes is a simple math. It is indeed a core concept, easily understood, but certainly not easy to accomplish. Not only will human nature suffice and perplex the manager, but he will find that administrative procedures, human resource policies, cultural concerns, the immediacy of everyday operational problems and the endless barrier of time management are all natural enemies to planning and conducting an aggressive successful "people-oriented" program. However, what must be borne in mind is that there is no more white-collar equipment, how well-trained the dog, how accurate the data, and how valid the risk education program, without a group of competent and motivated informed team members working toward a common goal, the project will fizzle.

MAC managers do indeed have a half-baking array of concerns. However, if they are ever to enable their "goons" to be successful, to transform or eliminate the terrors, and imaginative enough to edit their sashes, they will have to create a proper social structure within which any number of attractive mine action approaches can be harnessed.

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Coley: Technology and its Use in the Mine Field
Published by JMU Scholarly Commons, 2002

NOTES FROM THE FIELD

technology in the mine field

mines? What type? What depth? What condition?

TMAC operators were trained, test areas were selected and prepared, and the BDM86 was tested fine with mechanical reproduction mines (to ensure continuity of results from the Canadian environments) and then with real mines. It was important to use TMAC personnel and TMAC procedures as much as possible to be sure that the system could be integrated into their processes. There is little benefit in a system that can only do the job when operated in a laboratory manner; it must be compatible with existing demining operations.

To assist with this integration, CCMA developed a draft Standard Operating Procedure (SOP) that reflected the machine and the existing SOPs. Rather than simply drooping a piece of equipment in someone's lap, it is important to help them to make a part of their overall operations.

Results were consistent with the earlier insert tests. The Canadian government was pleased to respond to this request, insert and they made a donation consisting of a complete system plus a spare working head. The system has been held at work in the mine fields along the Thai Cambodian border ever since. The key to the technology that does get delivered is that you must complete the loop. Find out what the users need. Decide what you (realistically) have the ability to do. Do the laboratory level 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 before you leave home. 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 contained. Complete the connection between the users and the donors. Technology delivered.

Demolition Material Technology

In situ demolition 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 change easy to ship and store? How about making the change key prone to disappearance and misuse?

After working on a research program for the Canadian government, MREL came up with FIDOR, a novel demolition explosive. They had a solution, but was there a problem? Along with MREL's own research, CCMA helped to ensure that there was, in fact, a niche that FIDOR might fill. For its own part, CCMA could provide help with test and evaluation and with the development of SOPs (assuring successful test and evaluation). Again, the whole process had to be considered for the successful delivery of the technology. Identify user needs, develop testing, extract it into the field for real-world testing and finally, link up with a donor.

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

Victim Assistance Technology

Finally, let us examine a work-in-progress. CCMA is involved in the development, test and evaluation and delivery of a new prototype device that can not only render the device being used, but is following the same path described for the two previous examples. As with the previous technologies, CCMA worked with the manufacturer—in this case, Niagara Prosthetics and Orthotics (NPO)—to ensure that there was a need that would be met by this promising new development. Since many conventional prosthetic feet are awkward and lack the feel or action of a real foot, and since they are often too expensive, too complex and too short-lived for many mine-affected countries to bear, the need was clear.

With CCMA's assistance, NPO has been developing and testing the Niagara Foot in controlled laboratory conditions. Clinical (field) trials started in November 2000 in a cooperative program involving NPO, CCMA and TMAC with the generous patronage of the Thai Royal Family. While not yet commercially ready, the technology insertion cycle, the Niagara Foot is clearly following the same pattern as the two previous examples. Technology being delivered.

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

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 insertion of technology into the mine field: the failure of communication. The labs and the manufacturers often fail to get their message across and the end-user community remains unaware of what new or improved technology is out there. Just as importantly, the end users often fail to communicate their needs except in general terms. The labs can maintain a steady dialogue and ongoing research. The user community needs to present both its needs and the results of its real-world experience and tests. 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.

*All photos courtesy of the author

REFERENCES


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From the Director's Desk continued from page 112

with different motivations and different rules and mold them 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, promotions and the matters of a job well done. I am reminded of a saying, which the cynics often use (and which unfortunately, is too often true), that loves that a typical project will "punish the innocent, reward the guilty, and promote the non-participate." Would it not be wonderful if we could actually turn this phrase on its head and see it so that the basis, the standard and that is no matter how white-black the equipment, how well-trained the dogs, how smooth the logics, how precise the GPS, how generous the donor, how firm the standards, how well-fitting the prosthetic device, how accurate the data, and how valid the risk education program, without a group of competent and motivated integrated team members working toward a common goal, the project will fizzle.

MAC managers do indeed have a baffling array of concerns. However, if they are ever to have any hope of "getting the guns, tenacious enough to eliminiate or transform the landmines, and imaginative enough to edify their own country, they will have created the proper house structure onto which any number of attractiv mine action approaches can be harnessed.

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