



From the Director's Desks

Boys With Toys Chase Silver Bullet

by Joe Lokey
Deputy Director, MAIC

Issue 3.2 | June 1999

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One of those wonderful little anecdotes in the mine action community that everyone quotes and misquotes allegedly came from a 13-year old school girl in Halifax, Nova Scotia. When hearing of the technical challenges in locating and destroying antipersonnel mines she asked, "Why is it that we can run a mechanized shoe box around the surface of Mars but can't seem to locate a dangerous tin can just a few centimeters below the surface of the earth?" Out of the mouths of babes...

Without possibly understanding the depth of her query and its challenge to the scientific community, this young lass has, in youthful simplicity, grasped the daunting and almost inexplicable fact that, until just recently, very little science has been brought to bear on the landmine situation outside the military countermine nexus. This version of the *Journal* focuses on mechanically-assisted demining technologies in what we've affectionately referred to as our "Boys With Toys" issue. There are some tremendously talented engineers and scientists around the globe that have, for various reasons, begun focusing on the immense challenge posed by landmines and UXO. This is far from a state-of-the-art overview but the articles herein do, indeed, cover a broad spectrum and demonstrate where science is taking us. Further, we look forward to Handicap International's forthcoming book on mechanically-assisted demining and encourage everyone to obtain a copy.

There is also certainly enough evidence for cynics and activists to conclude that the new focus and interest in technology was generated from the hundreds of millions of dollars being poured by governments and large donors into a variety of programs and proposals. This short-sighted view by the habitual nay-sayers, however, are usually from those unable (or unwilling) to grasp the simple connection between research outcomes and the incentive to pursue them. Scientists are not generally well paid but they also do very little *pro bono* (free) work. We should not, however, discount the fact that scientists, and especially engineers, also enjoy a challenge and the landmine debacle is proving a worthy and elusive nemesis.

As we focus this issue of the *Journal of Mine Action* on mechanically assisted methods of clearance and detection, it is appropriate to keep in mind the context within which much of this development and experimentation is taking place. Toward that end, one has to look at the challenges and opportunities that surround the issue and, perhaps, take



some caveats from what we see. As the magical "silver bullet" that will solve all detection and removal challenge continues to elude us, so to does our ability, at times, to discriminate between appropriate and useful pursuits and those that are purely gratuitous and wasteful without any reasonable promise.

The size of the mine problem, even if only a fraction of the hyper-inflated nonsense bantered about by landmine activists, is immense and overwhelming given our technological abilities to deal with it. There is no vaccine. There is no antidote. There is no catalytic converter. Even if the Level I Survey initiative manages to put some sharper edges around the magnitude of the global problem, the next few generations have only the "low-tech" prod that is slow, costly in terms of long-term lives at risk, and is risky for those who pursue it. On the other hand, as Andy Smith has written, "No one at the sharp end I know would argue against a claim that, compared to the best efforts of machines as mine clearers, manual demining is safe, efficient, and not in need of immediate replacement."

Mechanical equipment and mechanically assisted methods of demining hold an alluring promise of making demining safer, faster, and more effective but the accuracy and efficiency of this extremely expensive equipment is no where near humanitarian standards at present or anywhere close to affordable for the war-torn countries that need them. It appears to some that only governments are coming up with the funding for this research. This should surprise no one who knows anything about capitalism or basic economics since there is almost no positive or attractive return on investment (ROI) for demining since there is no "market" per se for the results of their capital outlay. The German government concluded that only 30% of the APL contaminated land was suitable for mechanical clearance and even that figure did not eliminate areas where bridges and roads could not withstand the weight of some of these mechanized, earth-chomping behemoths.

Unless the research specialization is dual-use in nature, such as robotics, and has a payoff beyond demining, there is very little enthusiasm for privately financed initiatives to rid the world of landmines. Therefore, when governments control the technology dollars, they also make the rules. The bottom line, however, is that no matter what one may believe about the size or scope of the research and technology funding, it was not even there only a few years ago and there are some promising breakthroughs emerging already as many of the machines and systems in this issue of the *Journal* demonstrate. But promising or not, who is to buy them?


Let us also not forget that mechanically assisted demining is *brute force* demining. Some reasonably argue that it is, more than not, a bio-catastrophe just waiting to happen. Destroying layers of topsoil and root structures across hectares of arable farmland or delicate ecosystems makes little sense. Clearing brush and growth only to have it be the prime cause for erosion and flood exacerbation is even more insane. Mechanically churning up dioxins in contaminated soils in war torn countries and forcing them into the water table is not only a health debacle but near criminal. All demining equipment should have an environmental impact assessment built into their employment criteria.

One of the most objectionable aspects of much of the funding going into the research and development of mine action technologies is that it is being done so under the guise of a "humanitarian" label while making the international defense industries extremely wealthy. The European Union's (EU) biggest contracts for research and development have gone to consortiums of Europe's leading defense companies. Even in the US, the military controls and directs all "humanitarian" R&D for demining equipment. The amounts, when viewed from the eyes of the average aid organization, are staggering. The results of these huge sums of funding have been less than impressive when one attempts to find anything developed with these funds being used by US forces or global demining teams. No one denies the right of any country to establish its own resource allocation priorities nor does anyone suggest ceasing the R&D into faster and safer demining alternatives. However, when the amount invested appears disproportionate to the outcomes and the defense industries and military bureaucracies are the sole beneficiary of the profits, the seeds for speculation are thereby buried in fertile ground. Visibility and transparency of research funding spent and outcomes achieved would help to mitigate this but these institutions are likely to find that alternative unnatural and awkward. In discussing what should or should not be the level of research and technology expenditures, the operative word should be "balance." The balance, at the moment, is not "humanitarian."

If you can get past the question of appropriateness and not go into convulsions when hearing of the immense sums being spent, the rational person has a lot to be optimistic about. The comments and jokes about cockroaches, pouch rats, pigs, and honey bees being enlisted in the fight against landmines are not unlike the hysterical laughter that followed the horseless carriages down many dusty streets earlier this century. In spite of all of our technology, few have managed to create sensor systems that are even marginally as effective as those devised by nature. Different sciences are looking at different applications. Some are being field-tested and, as was speculated recently, almost 70% of the equipment in the field is a prototype of some sort and a variation on a theme--process improvement in action. Several international collaborations are under way and we will be reporting on those as they mature and produce results.

When reading some of these articles, try and imagine some of the early flying machines and the principles of aerodynamics that were a mystery at the time. The vegetation cutters, flails, bulldozers, tillers, sifters, backhoes, and potato-pickers all have their roots in other kinds of machinery being adapted or modified for the job of mine clearance. In some respects this is efficient because it encourages the maximum use of off-the-shelf technologies. Unfortunately, it is also grossly inefficient in that these technologies have proven to be woefully inadequate in terms of their accuracy vis-à-vis humanitarian standards. When explaining the inability of most mechanical detection devices to perform to humanitarian standards, the "...it's only one tool in the tool box..." lament seems to be the standard exit strategy from a tricky question.

The increased amount of information being begrudgingly shared, through this venue and other forums, is making it easier for scientists to collaborate and cooperate on common visions and objectives. No one agrees on what the answer will be but all agree it will be a multi-sensor system suite of some sort that takes the best of the most promising technologies and integrates them into a package that will be adaptable and



flexible in all mine contaminated environments. The toolbox will be smaller but more productive. The "payoff" to science in general will be immense as the effort to accomplish this will most certainly lead to other benefits yet undreamed. But the science of demining has, as its greatest benefactor, that girl in Halifax and countless others who may, one day, take a step that may change her life forever...or end it.