April 2002

National Mine Action: Problems and Predictions

Vernon Joynt
CSIR

Follow this and additional works at: https://commons.lib.jmu.edu/cisr-journal

Part of the Defense and Security Studies Commons, Emergency and Disaster Management Commons, Other Public Affairs, Public Policy and Public Administration Commons, and the Peace and Conflict Studies Commons

Recommended Citation
Available at: https://commons.lib.jmu.edu/cisr-journal/vol6/iss1/9

This Article is brought to you for free and open access by the Center for International Stabilization and Recovery at JMU Scholarly Commons. It has been accepted for inclusion in Journal of Conventional Weapons Destruction by an authorized editor of JMU Scholarly Commons. For more information, please contact dc_admin@jmu.edu.
National Mine Action: Problems and Predictions

Mine Action often does not effectively use the technology available. The author gives several examples of beneficial uses of technology in the field, and offers suggestions to improve the effectiveness of several aspects of Mine Action.

by Vernon Joynt, Technical and Scientific Consultant to the Council for Scientific and Industrial Research (CSIR), South Africa

Introduction

I recently received an email with real good news on the line so I would commit to sticking my neck in the nose once more. The questions included:

- Will technology ever improve speed and safety in Humanitarian Demining (HD)?
- What is the comparative efficiency among commercial, military and NGO clearance?
- Will dogs be more or less integrated into HD programs?
- When will land use priorities determine clearance priorities?
- Is “donor fatigue” a reality? If so, how do we fix it?

These questions are right in the middle of my current pet struggle to give technology its rightful role and place in mine clearance. I would like to discuss both technology in (HD) and donor fatigue, because technology is linked to funding. Present HD methods are too slow and ineffective at solving the total problem, so the donors do not get any value for their money. I want to present this article simply as a South African who has been involved in HD on one hand and associated with research and development (R&D) on the other. By 1996, as one in the South African government-owned demining group, I was already using a presentation slide that read: A Technologist’s Nightmare: You build the SILVER BULLET and nobody wants to see it.

For more information on the current mine action situation in response to September 11th terrorist attacks see: Update on Current Mine Action Situation in Afghanistan on page 99.

Will Technology Ever Improve Speed and Safety?

The simple answer is YES. In fact, for us as a demining group, it already has. For example, in 1991–92 we cleared 12,000 mines from around 62 pylons on the Maputo–South African border power line in Mozambique. We completed the job with two Camp Mine resistant vehicles (MRVs) fitted with various demining accessories: two armoured bulldozers; a detonating fuel-air gas mixture in one-meter diameter plastic film tubes to work in spots that the machines could not get to such as amongst the pylons bottom and stays.

Published by JMU Scholarly Commons, 2002
The blast pressure of the fuel air gas mixture is sufficient to set off the functional PMN and PMD6 mines used, but not the PMN2, which is blast protected. Due to the fast movement of the PMN2 pressure plate during the blast, we found the shallow-buried mines would jump out of the ground, making them visible.

Over most of the area being demined, the active mines were detonated by steel wheels and dropped disc-rollers. As a check, the bulldozers would push the soil and dead mines into heaps of earth that were sieved mechanically to limit what we missed. At that point in time (1992), all that the contract required was a safe surface to work on for the pylon repair crews, so only functional mines had to be removed, while UXO and dead mines under the surface were acceptable. Our crew played soccer on the swept areas to prove that no active mines were left behind.

A similar pattern appears after the normal steel wheel and disc rollers had passed. The gaps in the pattern showed where a dust mine was to be found and the deminers then simply destroyed it. For clearing military-laid minefields this pattern is the big advantage of rollers as opposed to flail or roller machines. The latter leave no such patterns and go over the mines that are not neutralised. Using a backup detection array is also an advantage or even a necessity.

Steel Wheel Casspir pulling Disc Rollers demining AP mines.

There are many in the demining community who have not really caught on to the South African approach of using MRV's like Casspir, Buffalo or Wolves linked to Steel Wheels and Rollers to detonate mines while flattening and removing vegetation. Punting in a machine that breaks and spreads the mines, the pieces of which you must later locate, does not support the approach. The choice of starting with a full or tiller as the first step in bringing technology to mine clearance, as is happening at present, is counterproductive for several reasons. It will make the use of dogs and other detection principles a problem. Broken pieces of TNT mix into the soil, making the use of dogs and other vapour detectors dubious. Techniques like Ground Penetrating Radar (GPR) also need the mines to be intact and upright, and the soil to be uniform without air gaps in it. Also, moving the surface-shrapnel into the ground makes using selectivity in metal detection more difficult to do. Now back to the example.

The total area cleared was 96,000 square meters, cleared in five weeks by seven men operating the machines and gas. One man was hurt on the bulldozer when he removed the visor of the bomb suit he was wearing because of the heat.

This bomb suit and helmet was used by the driver of the bulldozer. The helmet and visor are considerably stronger than the types used by deminers. These can stop the shrapnel of a Valmatta jumping mine at a distance of one meter. This pre-fragmented shrapnel is equivalent to that of a PROM 1. The only problem with the suit is that the price is $8,000 (U.S.) for the helmet alone. A pellet from a jumping mine had gotten between the driver's head and the helmet, grazing his head and drawing blood. He was lucky. The UN statistical figures for removing 12,000 mines show that we should have had at least six casualties, two of which could have been fatal.

The cost was $154,080, or $1.40 per square meter and nine cents for each mine destroyed; 450 square meters were cleared per man per day. During later contracts where we worked under UN standards and then had to also lift UXO and dead mines, the figures changed with the addition of manual demining teams who could work on such flat and foot "safe" ground at a rate of 300 square meters per man per day—up to 15 times faster than normal for working in virgin mine fields—to it only raised the cost to $1.50 per square meter. In this first example, technology proved its value by removing vegetation and providing face-safe ground.

Another example occurred in 1996, during the UN/CEV 111 contract in Angola, when 4,880 km of road was cleared to a width of seven meters in one year for $6.5 million. We cleared 215 mines consisting of improvised AT mines, normal AT mines and AP mines in the shoulders of the road and abutments of the bridges. A further 802 elements of UXO were uncovered. We used a total of 70 men, most of whom were manual deminers hired from a Zambian and a British demining company. They were supported by 24 Casspis and two Chubbly systems run by South Africans and Angolans.

A very important component of the team was the eight mine-detecting dogs (MDOs) of the American subcontractor and the 20 South African dogs, half of which were used at Cahama in Angola while the others were sent to Pretoria to run the detection component of the Remote Explosive Sensing Techniques (REST) system we were using for detecting low- and no-metal mines while doing QA behind the manual deminer. The REST system did the area reduction, with the dogs searching out low metal content mines. They found three no-metal mines that the handheld detector missed completely. The dogs held the key to the speed and cost advantages achieved in the contract, thus proving their worth in HD.

The total area cleared was 34,100,000 square meters (3,410 hectares or 8,440 acres), so the clearance was done at 19 cents per square meter (a third of the cost of normal manual demining), with 1,500 square meters cleared per man per day (at least four times quicker than usual for manual demining).

Today, other demining groups that do not use REST question locals and study other information available to do the area reduction. In Angola, this would be foolishly because AT mines need a vehicle wheel to trigger their firing mechanisms, and the vehicles using the roads were never using the full seven-meter width. On the contrary, they were often carefully using two-wheel tracks weaving down the center of the wide road. Furthermore, at least half a dozen groups were laying mines at various stages of the war, so information from those sources was not to be trusted even if it was available. The REST system has a scientific basis and has proved to be quite reliable over the course of more than 7,000 km of road contracts. Norwegian People's Aid (NPA) is presently using REST in Angola for road clearance and have found that they can speed up their operation considerably by doing so.

A third example concerns a contract done in 1996 in southern Mozambique. In this contract, we cleared 1.6 million square meters in less than six months using 28 deminers, removing 5,400 mines in the process. The pricing was distorted because the contract included training dogs, handlers and advanced demining managers for the local Mine Action Center (MAC) as a separate effort in the contract.

In a separate calculation, the pricing for the actual demining worked out at 30 cents per square meter. This was at least half the going rate for manual demining in that area. In this contract, we also did some work using a Casspir mounted metal detector array. It proved very very detector.

Based on a clearance comparison done on a 20,000 square meter (two hectare) piece of the minefields between the Casspir and our manual deminers using hand held detectors, the array managed to work 100 times faster, yet it still found all the AP mines that the deminers could find. The mines filled were a mixture that included PMN, PMN2 and PMD6 mines. These are all low metal content.
AP mines. An important observation that came out of this test was done while we were weighing and inspecting every piece of metal the hand-held detectors were signal-ling. We noticed that most of the false signals were pieces ofдержан and metal junk, like wire and bottle tops that were either on top or in the first 10mm of soil. The array had been modified to ignore such small surface signals but to still find a PIN2 on the surface. This was the key advantage of the array.

Comments:
• The manual deminers worked behind the array, and they uncovered an additional 1,640 metal signals not marked by the array. The 30 AP mines it

allowing the use of technology and three-fold increases for price and speed. During
the period from then until the end of 2000, we did 25 contracts for which the average contract price was slightly less than $400,000, and there was only one proper contract ($2.7 million in 1998) in which we could use the technology ef-fectively. This was the third example already given above.

The succession of small contracts where high capital investment and pro-bilization cost made the Casspins stay away virtually turned our group into a dog training company. The REST experience formerly has given us additional knowledge in the training and use of norm-AL MDDs. This contract size problem can be seen as one of the main reasons that the R&D component of our group has been moved into the South African government's R&D organization, the CSIR. R&D simply cannot be supported or properly used in these small demining contracts. The situation can be likened to a road building company trying to use its grader's and dozers to compete for the repair of suburban side walk contracts. If any one group must bear the blame for retarding technology in HD it must be those responsible for fragmenting donor monies into these small pack-ages. This really leaves demining technol-ogy in the hands of the military. The military has the further advantage of gen-erally assembling the best equipment, even if it is quite expensive. NGOs that have visionary management and strong financial support may become the tech-nology leaders in HD. As for the com-mercial companies, in my opinion they have no hope of competing, as long as the prescriptive nature and size of the con-tracts remains small as they are at present. Commercial companies are then forced into us-ing manual demining and MDDs, in stead of the technologies that have in the past already proven to be more cost effective, faster and safer. So in the end, it will prob-ably have to be the military, which is ac-cused of causing the problem in the first place, that will have to provide the final solution to the problem.

Comparative Efficiency Among Commercial, Military and NGO Clearance Teams

There really needs to be no choice favoring any of the groups on efficiency.

Did mark were the only mines they could find in the two hectare site, however,
• The array did mark a further 107 pieces of metal. Therefore, the array marked 15 times less false alarms than the hand detectors without missing the mines. So it was much more selected than the hand detectors.
• In light of the database of Demining Incidents Victims (DDIV) facts about how manual deminers miss at least three percent of mines, it would have been interesting to have had the ar-ray behind the deminers. We may have

unless financial constraints affect a biss. The way commercial contracts are pres-ently structured, commercial companies are at a disadvantage. The size of the con-tracts is simply too small to allow the use of expensive technologies to give them an advantage. Militaries can use such technologies and only pay operating costs. Let me illustrate this with figures out of our company's experience. In the period 1991 to 1996, we did 11 contracts at an average contract size of just over $1.5 million per contract. Three contracts were over $2.5 million, serve to bring high-technology techniques back into Mine Clearance (MC), so we should concentrate on these techniques. Apart from having a larger funding pro-file, such contracts are run by engineer-ing principles where speed and efficiency are insisted on and properly measured. I am thinking of contracts for building dams and roads, laying pipelines and re-pairing railways that have mine clearance requirements. In this context, there has been a re-cent incident where a survey technique regularly used in a HMC context was used in a survey done by the demining company contracted to do the survey. There was a fatal explosion in an area declared clear. This let the company do-ing a critical construction contract down. Talk has it that the company involved in the survey will not be used again—the possible financial losses to the larger con-tract due to doing the survey unscientifi-cally will not allow it. The same problem can also exist in the clearance operations. Whether the above is true or false, we observed this behavior in 1994 when we were contracted to redo clearance on three so-called cleared roads done by manual demining. We found quite a few additional mines left behind besides the

• Manual deminers checking the vehicle away paint marks and reconsulting the whole two hectare mine field.

Is “Donor Fatigue” a Reality? If So, How Do We Fix it?

(The following section comes from a paper I wrote entitled Why Do R&D?)

From 1997 onwards, the aid money was always split down into such small pieces that technology-based techniques could not be used. It is my opinion that this was done to favor manual demining in the false belief that it would make area clearance cheaper. What in fact happened was that manual demining made area clearance a lot slower and in fact twice as expensive. This line alone should the donors away because they were not getting value for their money, and they also saw no end to the problem in any of the contami-nated countries. Humanitarian Mine Clearance (HMC) was seen as a bottom-less pit into which money needed to be poured for another century or two be-fore the problem was solved. Today ev-erybody wonders about so-called donor fatigue. Even worse, the clearance efficiency of manual demining is now being severely challenged—another shock for the donors. Instead of HMC, I predict that Commercial Clearance Contracts linked to much larger financial projects would...