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Comments on the "Detonation" Approach

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Daniel Wolf and Steven Barmazel discussed the Public Health approach to demining in an article entitled "The Necessity of Implementing a Public-Health Approach to Humanitarian Demining,"[1] making some very valid points. However, Robert Keeley points out some problems with this approach that he feels need to be addressed before this method can be successful.

by Robert Keeley, *Asian Landmine Solutions*

Introduction

Daniel and Steven are right to point to the ideal of a Level Two Survey that defines the boundary of a contaminated area and properly reduces the area that is believed to be contaminated, so that the area freed up by the process is cleared to the same level of confidence as could be expected by a clearance process. This does seem to be a way to improve the overall cost benefit of mine action, rather than simply hunting for mine fields. However, I'm not sure that this approach automatically endorses the Level Two Survey technique that they promote in their article, and I'd like to discuss these points in more depth.

A Common Approach

First, I'd like to endorse the inclusion of this type of cost-benefit analysis approach. Belinda Goslin and I helped introduce similar ideas in Croatia in 1996 (with the help of Norwegian-Croat public health specialist Branko Kopjar), and since then, I know that several other people have considered this issue, such as Eric Filipino in his recent publication at GICHD, "A Study of Socio-Economic Approaches to Mine Action." (I wish that it was on a website somewhere, as it would be easier for other people to get copies of it!)

I raise these examples not to make any sort of "Yah boo, we thought of that before you did!" comment, but rather to make the point that many people in many places have similar ideas. Although it could be an example of "if you put enough chimpanzees in enough rooms with enough typewriters, eventually you'd get a copy of Hamlet," I hope these examples of "parallel processing" really mean that many of us are thinking the same sort of thing, which (hopefully) means that we are making some sort of progress.

The public health/socio-economic/cost-benefit analysis approach also applies to the areas of R&D—many of the cries in the separate article in the same edition about the DTIF conference[1] bring eerie feelings of *déjà vu* when I read about the eternal question of balancing resources for R&D against allocating some of these resources for projects using existing methods. The cost-benefit question will come up again later in these notes.

It was the point about using "detonators" as a Level Two Survey technique that caught my eye. First, we need to unpick the linguistic confusion—as Oscar Wilde said, the English and Americans are "two nations separated by a common language," and to us users of British English, a "detonator" is what I believe those on the other side of the pond call a "blasting cap." I'm assuming that Daniel and Steven are talking about the use of a mechanical impact device (such as a flail or roller) to initiate mines—so perhaps "Level Two Survey by Detonation" would be a term we could all agree on. Sorry to be so picky,

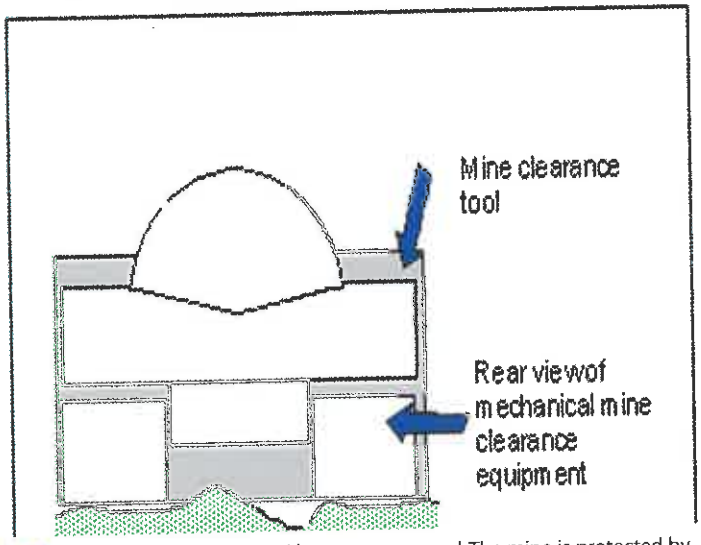

Figure 1: Problems caused by uneven ground. The mine is protected by being at the bottom of the undulation.

NOTES FROM THE FIELD

Middle East

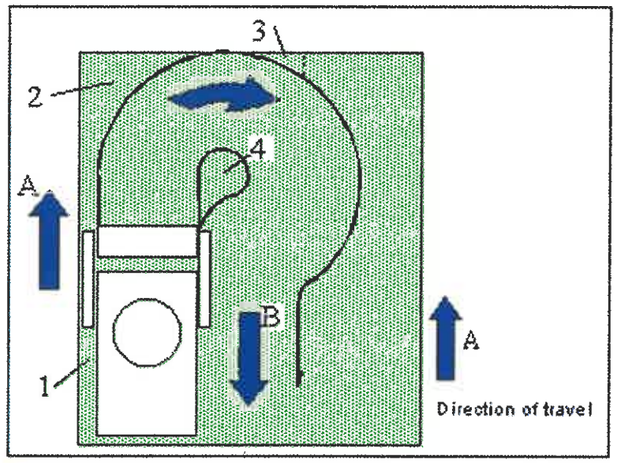

Figure 2: Common problems in the guidance of mechanical clearance devices (areas 1–4 are the areas missed).

but in my experience of the last 10 years in this industry, it's always worth the effort to get the definitions correct as early on as possible!

This basic idea—that you drive a machine in as far as possible until something goes *bang*, then use the location of the bangs to define the perimeter—has been around for a while. We were certainly talking about it in UNPROFOR (the UN mission in Bosnia and Croatia) and the follow-up humanitarian demining missions with representatives of NPA and Technopol in 1995–6. The Slovak manufacturers of the Bozena, and both Hendrik Ehlers of MgM and David Hewitson of ELS have been conducting work on the same ideas for years now (another example of parallel processing). The motivation for this technique was simple: bayoneting our way in from the Croatian coast wasn't an option, and how could we use machines *that had already failed as total clearance devices* to help reduce the total area that we might have to clear? In other words, could machines, used in this way, help us improve the overall cost-benefit ratio of demining and help us target our resources against priority targets more effectively?

I think that, five years later, the answer is still—at best—"Yes, well, maybe," and so I don't think it's fair for Daniel and Steven to state so categorically that "mechanical detonators are more than adequate for this task" or that "mechanical detonators allow quick area coverage . . . thus increasing survey speed while reducing cost." I'll explain why I think this below.

Problems

There are two main problems with such enthusiastic and categorical endorsements of the "Level Two Survey by Detonation" technique. These are:

- The machines do not detonate 100 percent of the mines—let alone UXO—that they cross.
- Machines are not necessarily more cost-effective.

Not 100 Percent Effective

This first came up in my experience in Kuwait, though some of the lessons (not) learned by others in Afghanistan were directly relevant. The representative of a company selling and operating machines on contract in Kuwait endorsed the use of a flail machine for clearance of a beach mine field, even though one of the junior managers of the company who hired the flail had had personal and unsatisfactory experience with the same machine used in this way in Afghanistan. He said that the machine had failed to detonate at least 50 percent of the PMN2 mines it had encountered there—and as many readers are aware, the PMN2 includes a cunning mechanism that was intended to protect the mine against explosive overpressure. The junior manager postulated that the flail would have the same problem against the Italian VS-50 mines in the beach mine field in question, as the VS-50 has a mechanism with a similar protective effect. He suggested that the soft sand and the smaller mine size would exacerbate the problem. He then went on to prove this by disarming some VS-50s, removing the main charge, painting the mine bodies orange and replacing the detonators. He then re-armed the mines and invited one of the flail crews to drive over the mines—50 percent did not detonate. Now, only a small sample was used—he had had to recover the mines himself and therefore only had four—but, given that the aim was to remove ALL of the mines, this gave serious room for doubt. I won't go on with this story (which had a sad ending) except to say that a similar test based on this story, which we conducted in Cambodia, with a different flail, had very similar results against the PMN2, corroborating the Kuwait and Afghanistan experiences and helping us prevent injury in that case.

Rollers proved even less effective in Croatia, where they had the unexpected side effect of knocking down crops on top of mines and masking the mines from the rollers when they passed over them. These results, and others elsewhere, have led us all away from the idea of using rollers and flails as "one stop shops" in the demining process. However, the point of these examples in the context of these notes is: if we can't be sure that the first bang made by the machine is as a result of it successfully detonating the first mine that it has passed over, how do we then use this result to determine the boundary of the contaminated area?

It has been suggested occasionally (though not in Daniel and Steven's article) that the number of passes made by the machine can increase the effectiveness of the result, but let's be clear that that is *not* a valid conclusion to draw in this case. If the mechanical impact isn't going to set off the mine because of a protective mechanism in the mine, then more repetitions of the same technique do not guarantee an eventual success. We are not hammering in a six-inch nail! In fact, if anything, this is more likely to disrupt or mechanically destroy the mine (perhaps a good result in itself, but also contributing to the uncertainty about where the edge of the contaminated area is). There is also the problem, rarely encountered in the land of brochures and sterile trials, that we are not demining football pitches and that the ground in mine fields is usually uneven. Mines at the bottom of undulations (see Figure 1) aren't going to be hit by the wheels or hammers, no matter how many times the machine drives over, and the more energetic techniques—such as flails or soil mills—can even contribute to burying the mines further by redistributing soil on top of them. Furthermore, anyone who has ever had to supervise any sort of construction plant will know that it seems to be impossible to make the plant operators drive in a straight line (construction engineers all over the world believe that bulldozer operators are united in a common bond to knock over all the site markers that the engineers put up on a construction site), and this problem is only exacerbated by the use of remotely operated plants, so we really can't be sure that the machines have covered all of the ground that we want them to (see Figure 2).

The Cost-Effectiveness of Machines

The second problem with Daniel and Steven's endorsement of "Level Two Survey by Detonation" is with the implied generalization that machines will always reduce costs. Unfortunately, this is not necessarily the case. At least one machine tried in Asia recently consumed more dollars per day in diesel fuel (let alone maintenance and transport) than it cost to fund the deminers it was claimed that it could replace. Now, while it may be easier to make the case for machines in the Balkans (where deminers are comparatively expensive), the fact that we can't trust them to clear all of the mines means that (a) while the Level Two Survey finds mines in an area that we need to clear for the project involved, we still need to use the deminers (i.e., the total cost is machine + deminers, NOT machine instead of deminers), and (b) even if we could use the machine to determine the boundary of the mine field, what happens if the first mine found is only one meter from the start line?

What Does This Mean?

While I agree with the general thrust of David and Steven's support for "Level Two Survey" and that machines can have a part to play, I feel that this deserves to be predicated on the basis of several caveats, including something along the lines of:

- Where a machine is used to determine the actual perimeter of contamination within a suspected mined area, the use of the technique involved must adequately demonstrate how the boundary of the contamination is determined given the limitations of the machine involved. Where this is not possible, a second method, such as dogs or manual clearance, must be used.
- Planning the use of machines in Level Two Survey *can* have valuable benefits in terms of improvements in speed. The cost of the machines must be offset by the benefits in demonstrated reduction in deminer hours.

This *can* be done. For example, a machine that is used to clear vegetation and prepare ground ahead of manual deminer teams can speed up a project (though not always—think of trying to clear up mines when you're working behind a mine plough that's just buried mines in heavy clay!). That's why we talk about "mechanical ground preparation" (and I believe Hendrik talks about mechanically assisted demining). It comes down to that old slogan: "Are we making it faster, cheaper or safer?"

Conclusion

Am I being picky? Perhaps. I certainly don't want to detract from the overall thrust of the article and its illumination of the cost-benefit analysis approach to demining. However, I hope my comments will be taken in the light of helping us all reach the goal of good Level Two techniques and so improving our productivity. ■

**All figures courtesy of the author.*

1. See *The Journal of Mine Action*, Issue 5.2, Summer 2001

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