THE MYTHS AND REALITIES OF DEMINING

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STRUGGLING WITH STEREOTYPES

For an issue that has received such intense media attention, it is surprising how little is really understood about demining. Most of the public seems to be divided between those that believe the landmine problem evaporated with the arrival of the Ottawa Treaty, and those that still believe it will take thousands of years and billions of dollars to solve. Both views stem from sensational media coverage originating within the mine action community and both are, of course, equally wrong.

Among those that do recognize the on-going need for demining, there is often a sneaking suspicion that technology to improve the process already exists. Most know that humanitarian demining is slow and dangerous and see a need to enhance it but, despite years of research, little seems to have changed; why is there still no simple solution to mine clearance?

To answer this question, we need to understand something about mines and minefields. And therein lies the difficulty, because most people feel that they do know something about the problem; they fail to see why lifting such inherently simple munitions (mines) from open ground (minefields) should prove quite so challenging.

The fact is that, while myths and stereotypes are plentiful, very few people understand the realities of mines or the environments in which they are found. These are the most central factors in demining, yet they tend to be dismissed, or at least over-simplified, in the relentless pursuit of innovative solutions. Failing to grasp the fundamentals inevitably creates a false perception of the problem, and all too often the consequent misunderstandings lead to wasted resources and the development of useless equipment.

What follows is a quick overview intended to illustrate the reality of the mine threat. The aim is not to record an exhaustive list of potential problems, but rather to put the typical preconceptions about mines and minefields into a more balanced perspective. If nothing else, it should become clear that the subject is far from simple.

MINES

The Over-Publicized Blast Mine

The universal stereotype landmine image — even within sections of the mine action community — is of a small non-metallic anti-personnel (AP) mine. Many pressure-operated blast mines are plastic cased and do indeed have a minimal metal content, although very few are truly non-metallic or undetectable. It is true that these mines constitute a substantial proportion of the threat and continue to cause serious problems for deminers in many parts of the world. However, since they became the focus of media attention, the threat from other mine types has been largely ignored.

The AP blast mine even has a couple of points in its favor. First, the fuse requires direct and often fairly substantial pressure (typically 20 to 50 lbs); second, the plastic casing creates a very limited fragmentation hazard and is rarely lethal. There are numerous examples of deminers escaping accidental detonations with minor injuries, so for the well-protected operator, adhering strictly to standard operating procedures, AP blast mines are not the greatest danger. If the reliable detection of minimum-metal blast mines were the only problem faced by deminers, clearance rates would be several orders of magnitude greater than they are.

The Lesser-Understood Fragmentation Mine

There are three categories of fragmentation mines: stake mines (so called because they are mounted on short wooden stakes) and bounding (jumping) mines scatter fragments in all directions when they detonate. Claymores are more directional, firing their fragments in a cone or fan-shaped pattern, rather like an immensely powerful shotgun.

To the uninitiated, their high metallic content makes these mines sound almost deminer-friendly in a world with metal detectors, but the reality is very different. To begin with, most fragmentation mines are initiated by tripwires so, unlike the blast mine, direct contact is not required; these are area weapons with area fusing systems. While most blast mines require substantial direct pressure, tripwire actuation may take as little as 1 or 2 lbs. Gone too is the comforting notion of adequate protection. Not only will a mistake with a fragmentation mine invariably result in serious injury or death, but somebody else's mistake — some distance away — may get you killed as well. The detection of tripwires is every bit as important as the detection of minimum-metal mines, yet attracts a tiny fraction of the research effort.

The power of a fragmentation mine makes it virtually impossible to protect a nearby deminer, while the substantial range (in excess of 100 yds) makes it impractical to maintain adequate safety distances. Protective equipment has to be worn, yet offers no guarantee of safety; meanwhile it restricts peripheral vision, increases fatigue, and can make the operator dangerously clumsy. When a fragmentation mine is detonated, whether by accident or intent, the fragments also contaminate a large area, interfering with any subsequent detection or quality assurance process.

Such is the strength of the blast mine stereotype, that people often overlook the fact that many fragmentation mines are placed above ground to maximize their effect. Being visible, once again, ought to make them safer, yet often the lethal range far exceeds the distance at which they can be seen; in other words, they can see you before you can see them. Mines and tripwires placed well above the ground create a three-dimensional threat, complicating both location and demolition. To the vast majority of the scientific community, minefields are seen as strictly two-dimensional planes; this means that, in every sense, a fundamental dimension of the problem is being overlooked.

Anti-vehicle mines

Amid the intense focus on AP mines, it is easy to overlook the fact that anti-vehicle (AV) mines are responsible for a significant proportion of mine-related casualties. They make no distinction between military and civilian vehicles; with up to 100 times the explosive content of an AP mine, the blast from an AV mine can kill at far greater range and creates a lethal 'secondary fragmentation' effect from nearby objects. Even large animals can be heavy enough to initiate AV mines, killing or injuring any nearby people or livestock. It is also important to understand that a number of AV mines fitted with sensitive tripping devices can be actuated by people.

Rules of Mine Laying

It is the indiscriminate use of mines that has the greatest impact on communities, and among the irresponsible users, there are no rules. In addition to routine camouflage and concealment, improvisation makes every aspect of the mine threat unpredictable. Examples include stacking mines, the use of wooden stakes to initiate deep buried mines (to avoid detection), the linking of fragmentation mines to create killing zones, and the use of AP mines to nitiate far larger charges (such as artillery shells). Additionally, virtually any mine can be booby-trapped, further complicating the clearance process and demanding yet more precautions.

THE ENVIRONMENT

Killing Fields, Not Playing Fields

The stereotype image of a flat, grassy minefield is just as limited as that of the non metallic blast mine. Yet the "football field" image is constantly reinforced by the trials, demonstrations, and publicity shots that invariably take place in near-perfect conditions. Even ignoring the special circumstances of Kuwait's oil lakes, the Middle East's drifting sand dunes, Afghanistan's mountains, or the Falklands peat bogs, minefields are rarely flat and featureless.

To begin with, there is vegetation. Minefields are not harvested or grazed, and many lie in the type of hot, wet environment that promotes the rapid growth of foliage. Most of the world's minefields have been in place for years, and many have become totally overgrown. Not only does this create a physical access problem, but the inability to spot fragmentation mines and tripwires makes overgrown minefields particularly dangerous. In some regions of Cambodia, more than 80 percent of the time spent on manual demining is devoted to the clearance of undergrowth. One of the few areas of real progress in recent years has been the introduction of mechanized vegetation cutters, which gain rapid access to the ground and eliminate the threat from tripwires.

The minefields of the real world are often uneven and cluttered with obstacles, natural and man-made. Rocks of all sizes create problems for the deminer, and even small stones can make probing almost impossible. Most vehicle-borne systems are completely defeated by heavily forested areas, steep or very rocky terrain; even for deminers on foot, access and movement can be difficult or dangerous. From the mountains of Afghanistan, and the steep border regions of Oman, Chile, and Peru, to the forested hills of Bosnia-Herzegovina, Croatia, and Kosovo province, terrain imposes serious limitations on demining procedures. Meanwhile, forces of nature constantly conspire to bring elevated mines down to earth. For example, it may be a rut or pothole just beyond the reach of a detector, flail hammer, or roller, or the bottom of a hill — perhaps well outside the existing minefield boundary.

Water is the most influential of the natural forces, with the capability to erode and dislodge mines, carry them well away from their original locations, and even to bury them again. Water can also create obstacles impassable to any mechanical clearance equipment. In the Jordan Valley, the river has cut 12-foot gullies through mixed (AP and AV) minefields; some mines are left dangling over the cliff edge while others are buried under the collapsed ground. Several miles downstream, the Sea of Galilee must be patrolled daily to check for mines washed up on the beaches. Elsewhere, mine clearance is made almost impossible by tidal action on the beaches of the Falklands, standing water in the rice fields of Cambodia, flooding in the South Chilean islands, and snow in the minefields of Bosnia-Herzegovina.

Battle Areas

Not surprisingly, mines are often found in and around battlefields where the ground has been contaminated with the scrap of war. At best, there will be large quantities of metal present: one shell can produce thousands of steel fragments, and each splinter will be large enough to dwarf the signature from a minimum-metal mine. At worst, the area may be cratered, strewn with wire (barbed wire, communication cables, and the guidance wires from missiles), and littered with unexploded ordnance (UXO). Using metal detection, false alarm rates can exceed 1,000 to one, resulting in a considerable amount of wasted time and effort. In some areas, metal detection simply is not an option.

The detection failure rate among conventional munitions generally exceeds 10 percent, and can be far higher. This means that the quantity of UXO often dwarfs the number of mines, as was the case among the submunition strikes in Kuwait and Iraq, Kosovo and Afghanistan, where huge numbers failed to function. Most types of UXO are less hazardous than mines, but this is not always so — particularly with submunitions.

Urban Areas

The word “minefield” strongly conveys a rural setting, yet some of the most awkward and dangerous minefields are in urban areas. In most cases the presence of buildings, walls, fences, overhead and underground services, paths, and roads makes use of mechanical equipment impossible. These obstacles — with their high metallic content, voids, electric and magnetic fields — also rule out the use of most automated detection techniques. Inside buildings, where virtually any type of booby trap may have been used, clearance techniques have more in common with counter-terrorist procedures than traditional demining. In Afghanistan, the collapse of buildings and subsequent re-mining have created layers of mines — sometimes to a depth of several feet.

Another important consideration is infrastructure — or rather the lack of it. Communications and repair facilities are strictly limited in many of the heavily mined developing countries. There is also an assumption that road and rail networks are universally available for the movement of heavy equipment but, in some regions, routes have become virtually impassable. Even where suitable tracks still exist, few of the bridges can cope with anything more than light trucks. Good mobility, survivability, and sustainability are therefore key considerations for demining equipment in remote regions.

SUMMARY

Any one of the problems encountered during mine clearance can significantly complicate the task — and the list outlined here is far from exhaustive. Unfortunately, in any given area of the real world, a number of problems tend to be superimposed, resulting in a complex, unpredictable tangle of mines, UXO, and tripwires, often in difficult terrain littered with man-made and natural obstacles. There will never be a single solution, because there is no single problem.

Given the practical difficulties faced by deminers, it emerges that much of the technology under development will have, at best, limited application. Sadly, some research has been so misguided that the effort has been totally wasted. The detection of minimum-metal mines, seen by so many as the Holy Grail of demining, is merely one of many problems, and the clearance of flat accessible ground is generally straightforward. Meanwhile, above-ground mines, tripwires, steep slopes, heavy vegetation, and water obstacles rarely feature in equipment test sites and demonstration areas.

One of the greatest obstacles to the enhancement of demining has been, and continues to be, the oversimplification born of deep-rooted preconceptions. At last, there is some effective communication between the scientific and operational communities to ensure that problems are clearly articulated and potential solutions are realistic. There will never be a simple, universal solution to demining, but there can be continual improvement of equipment and techniques. Understanding that there is more to the mine threat than small plastic objects buried on playing fields is fundamental to that process. ◉

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