

The business of land-mine clearing

Bob French

Considering that some eighty countries have a problem with land mines, and observing the consequential effects on their economies, the amount of money available for the task of clearance is miserly. Depending on the country, terrain, climate, commercial clearance, and Non-Governmental Organization (NGO) involved, costs to clear mines can vary from US\$2 to US\$39 per square meter. As an example of the size of the problem, Bosnia-Herzegovina has over 18,000 minefields mapped, with probably the same again not yet mapped. The mapped area represents approximately 3,000 square kilometers of contamination of which around 1,000 square kilometers is good agricultural land. In 2002, four square kilometers were actually cleared. There are those who will claim that more land was released because of the clearance done but in terms of the amount of land contaminated the results are pitiful. The reason? A lack of proper funding and the non-development of a market in demining activities, which would encourage investors.

The land mine

Mines have been around nearly as long as gunpowder, but modern land mines were developed in World War I to counter the advent of the tank. Antitank mines were used against this then-new, unstoppable weapon. However, the mines could be moved with reasonable ease and used against the tanks of the people who first laid them. To prevent this, small “antipersonnel” mines were placed around the antitank mines to catch demining engineers when carrying out clearance operations. It was noticed that if the explosion resulted in a badly wounded man it took medics, stretcher-bearers, doctors, nurses, and a large part of the enemy’s time and effort to look after the victim. And if the mine killed, then the body could be ignored and dealt with at a later date. This led to a smaller and cheaper mine design with less explosive. To counteract these new antipersonnel weapons, mine detection equipment was developed. This detected the metal from which the mines were made, located them, and allowed them to be dealt with. To overcome this countermeasure, a minimal metal mine was designed using a wooden case. These mines would deteriorate over time, as their cases were eaten by termites or just rotted away. The explosive, left behind, was still fitted with a detonator but the mines were less likely to explode if disturbed.

Further attempts to make detection difficult introduced mines with wax paper bodies, and today we have the plastic mine. Further development has changed the mine from a simple pressure-activated blast mine to mines which are remotely

detonated or operate by trip wires, and mines which jump up to stomach height before firing shrapnel in all directions. In the Balkans, this type of mine kills more demining personnel than any other type. Simple shrapnel

mines can be made at the kitchen sink and can be found throughout countries with mine contamination efforts. More sophisticated mines spread from helicopters or aircraft are self-righting and sit waiting to fire missiles at vehicles as they detect them. There are also mines having speech recognition capabilities, selectively detonating when hearing an enemy speak. Today, over 300 types of mine kill, wound, and adversely affect hundreds of thousands of people yearly.

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Uses and problems on the ground

Antipersonnel mines are used for various reasons and situations. They are used by the military as a “force multiplier.” Situated properly, a minefield can cause an enemy to take a certain path reducing the number of troops needed to defend an area. Troops use them as “silent sentries,” allowing them to get rest. A quote from an interview with a soldier by a United Nations investigator reads: “Once fighting starts, mines are part of my personal insurance policy. They watch my back when I am exposed, they take the bite out of a surprise attack on my position, and they let me sleep at night. The only problem is the other side has them too – down at our level everyone needs insurance.” Insurgents and guerrilla forces use them as a terror weapon to extort money by the threat of laying mines. They are put around houses to prevent populations returning after they have been forcibly moved. During civil wars or guerrilla activities, mines are put down indiscriminately without records of where they are laid, their types, or how many there are; this has applied to western armies operating outside of America or Europe. They are also used by governments to move populations out of an area or stop them moving into an area.

Minefields are easily laid: it is a matter of minutes to scatter antipersonnel mines over a large area. Tossed from an aircraft or helicopter, fired from mortars or artillery, it takes little time or effort. The hand setting of mines and booby traps has become a military art, not only to kill the unwary enemy but also to outwit the enemy’s demining engineers. Unfortunately, after conflict, with little accurate information on the type, numbers, and whereabouts of the mines, the clearance becomes extremely hazardous, resulting in the killing and maiming of demining personnel.

Today’s land mine problem usually follows a path of war, cease fire, more war,

and more cease fires. Mines that have been laid are not mapped, and the person who has laid them has often been killed or left the country when peace finally comes. Take Angola as a fairly typical example to see how the resultant devastation carries on after the last shot is fired. After decades of war, a cease fire agreement was finally signed; the two factions of the government and UNITA decided enough was enough. The major problem of land mines and the debris of war will need considerable funding to rectify. International interest is essential if Angola is to get back on its feet again; having considerable mineral wealth may help.

Estimates of the number of land mines vary from two million to ten million, with the United Nations estimating seven million. The number of mines is irrelevant if a mine is in your back yard. The problem comes when mines are suspected in an area, but no one is sure where or how many. This can tie up large areas of land and take up inordinate amounts of time and money, resulting in loss of income from farming or industry, injuries to people and animals, and reduction in trade and commerce until an area is declared safe. The most contaminated areas also tend to be the highest populated ones. The cities of Huambo and Bie, in Angola, are highly contaminated, and contamination in the provinces causes major disruption in trade and population movement. Farming, in some areas, has come to a halt. Mines are seriously affecting the agro-economy and, with it, any hope of socio-economic growth. Incidents of mine accidents and deaths are reported on a regular basis. The number of deaths and accidents to both human and animals will probably never be known. As in most African and Asian countries, mine casualties are caused when people are carrying out everyday tasks such as farming, collecting firewood for cooking, or traveling on roads or paths which they have trodden for years. Information about land mine incidents is hampered by lack of good communications and adequate funding.

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off the wall to his house, it exploded. He lost both hands and had his sight impaired. A mine incident not only affects the injured. Families can lose the breadwinner, other members of the family are traumatized, as can be the

professionals involved. Also in Bosnia, three young girls went for a walk in a field of flowers. One set off a shrapnel mine. Two of the girls died instantly, while the third lay seriously injured, crying out for her mother. It took six hours for the demining team to work their way across the field, ensuring a cleared path in and out for the medics. The girl died on the way to hospital. Members of the demining team were distraught: they could hear the girl moaning as they worked as quickly as they dared to get to her. The three families and close friends were obviously affected, as were the medics who had waited six hours before being able to try and save her. From 1996 to 1999, US\$6 million were given to the Mine Action Program in Angola. But throughout the world, donations are being reduced as rich countries suffer from donor fatigue and the political kudos from supporting Mine Action Program become less high-profile. This can be seen from the increased support for Iraq, which is in the news, and the reduction of support in Bosnia, Kosovo, Burundi, and other countries that are “not-so-newsworthy” anymore.

The Ottawa convention

Many people believe that land mines have been banned and therefore do not exist any more. This impression has been brought about by the publicity given to the Ottawa Convention to ban land mines. The Convention hoped to ban the manufacture and use of antipersonnel mines with signatories removing all such mines from within their borders within ten years of signing. The Ottawa Convention banning anti-personnel land mines entered into force on 1 March 1999. A year later, 139 countries had signed the Convention, 110 of which had ratified, but 54 states remain outside the treaty. Significantly, most of these are the main manufacturers and users of the devices. The effectiveness of the ban has been undermined by the failure of the United States to sign. In the recent conflict in Iraq, the United States stockpiled some 90,000 antipersonnel mines in the Gulf even before the conflict started. Many other countries are still holding, using, or manufacturing antipersonnel mines, including big players such as China and Russia. It is not only antipersonnel mines which present a menace after conflict. The use of cluster bombs present a real and present hazard as many such devices fail to explode on landing but detonate when moved or are wind-blown from trees and hedges.

Generally, demining activities are carried out by volunteer NGOs, commercial enterprises, and a small amount of military clearance. Demining organizations rely upon donations or contracts from private funds, government grants, charities, the World Bank, and the United Nations. Private funds are given by individuals or groups of individuals and generally are to rectify a particular problem around a school or housing. Demining includes the removal of unexploded ordnance (UXO) such as rifle grenades, mortar shells, artillery shells, and cluster weapons. In 2003,

the United Nations received US\$40,209,250 for this purpose. How much of this gets down to the actual demining activity is anybody's guess.

The demining work

Demining is carried out manually, or with dogs or machines. Manual demining is by far the most common method used but is usually combined with one or both of the other systems. Manual deminers are, for the most part, ex-military personnel who find it difficult to secure other employment after conflict has finished. In some countries due to the post-conflict lack of men, women are trained to become deminers. The training is the same for everyone and is carried out in special training facilities set up by NGOs, commercial demining companies, and the United Nations. When conflict is over, and a country is stabilized, it will set up its own training schools under the supervision of in-country "Mine Action Centers." A demining course takes approximately six weeks, followed by an apprentice time of close supervision in the field. For dogs, the training takes many months, and this only after careful selection. Dogs have limitations in that they cannot work when it is too hot, too wet, or where there is a large concentration of explosive material. They also have their off days, making empathy with the handler most important. Some countries put more faith in dogs than others. Basically, it comes down to training, the handler/dog relationship, and in-country attitude to dogs.

Manual demining is slow, boring, and hazardous. In many cases, where there is dense vegetation, this will have to be cut by hand. The demining process consists of clearing lanes one meter wide. To limit damage in the event of an accident, these lanes are approximately 35 meters apart. At the start of a lane two sticks, painted red and approximately one meter in length are stuck vertically in the ground one meter apart. Two smaller sticks are placed 20 centimeters on the outside of each of the two tall sticks. If vegetation has to be cleared, a stiff piece of wire, such as that from a coat hanger, is pushed carefully into the vegetation and lifted gently to see if there are any trip wires present. This is done several times across the width and height of the lane vegetation. After this is done the vegetation investigated is cut with secateurs or a saw, down to around 50 millimeters. The area is then checked with a metal detector, in case the mines are minimal-metal. If there are a large number of metal fragments in the area, the metal detector will give many false alarms. If this is the case, then deminers have to resort to "prodding" the ground with a metal or plastic prod. Here a 25 millimeter square stick, and one meter and forty centimeters in length, is marked in 50 millimeter divisions on each face. The divisions are offset by 25 millimeters on consecutive faces. The stick is laid on the ground across the start of the path and the prod is pushed into the ground, by each mark in turn, at an angle of 30 degrees to a depth of 200 millimeters. The depth into which the stick can be pushed will depend on the

hardness of the ground. The danger is that pushing too hard could activate a mine. After pushing the prod into the ground against each mark on the stick, the stick is rotated one side forward and the process starts again. Each time the stick is rotated, the deminer moves forward 25 millimeters. At the vegetation line he must start the whole process again. It can be seen that in an area where there may or may not be mines, if the deminer has been weeks without finding a mine, boredom sets in and accidents can occur.

Demining with dogs is also used. Many factors influence their efficiency. A common way is to divide a field into boxes by manually clearing meter-wide safety lanes around each box. The boxes can be of different sizes but 10 meters by 25 meters gives an idea. Provided that the vegetation is not too thick, say tall grass and not dense shrubbery, the dogs are sent up and down one-meter wide lanes within the box. If they indicate that they have smelt a mine, they sit. The dog handler marks the place where the dog sat and shouts "mine." The dog is taken off the area and rewarded, while the mine is pinpointed and dealt with by the stick-poking method. After dealing with the mine, the procedure is restarted. During the time the mine is being dealt with, all other demining stops for safety reasons. Where there is dense vegetation and the terrain is suitable, a flail machine can be used to get rid of the growth, bringing the vegetation down to a level in which the dogs can be used. If the flail sets off mines, some time may be needed before the dogs can be put back to work as the explosives from the mine will have contaminated the area and this is likely to confuse the dogs. If the ground is too wet or the temperature is too hot, the dogs become less efficient.

Machines have been used by the military for minefield breaching. Here they want to get troops and transport across a minefield as quickly as they can. No consideration is given to the natural environment, and a certain level of casualties is deemed acceptable. In post-conflict clearance, the aim has to be for zero casualties on land that is declared clear. After conflict, mine clearance has tried to adapt military machines for their purposes. The "flail system," which comprises a rotating cylinder with chains fitted along its length, moves across a minefield, flailing the ground and setting off the mines. This is the most commonly used type of machine as it has been around the longest and is the most simple to produce. Unfortunately, these machines are not 100 percent effective, often leaving broken mines with detonators intact, or throwing mines onto cleared areas, or altogether missing smaller antipersonnel mines. Delicate soils do not take kindly to being beaten by chains and can become infertile through impaction or soil breakdown. Other methods used are rollers which also tend to miss small modern antipersonnel mines, and mine-ploughs which push the soil and mines away from the desired track such that the mines are now in a mix of subsoil and topsoil and can lay at any angle or depth, making demining extremely hazardous. Other military methods for minefield breaching are used, but none are suitable for post-conflict clearance.

Today, some specially designed machines are coming onto the market but with little support from government and, in a difficult market, these are few and far between.

Prospects

The Ottawa signatories agreed to remove all land mines within their borders within ten years. With current funding and methods, it is outlandish to believe this is possible. The quickest short-term solution is to increase the use of mechanical methods where possible, properly fund current efforts, and increase funding available for research and development, carefully looking at which projects will bring the fastest results. A project that will find an answer in twenty year's time is not proper use of funding. If a bulldozer and bucket can clear a mine problem in a certain area or an adaptation of existing machinery can produce results, then this is where the money would be best spent. If an area of 100,000 square meters is suspected of contamination with mines, then methods of "area reduction" should be used. Any suitable machine could be put over the ground, locating where the mines are, thus reducing the area that needs to be searched in detail. Thereafter, more secure methods can be employed to clear the newly defined area. This would speed up clearance considerably and give the donors a better return, in square meters cleared, for their dollar. Innovation and manufacturing of equipment needs to be encouraged by the international community. Rules, regulations, and compulsory testing of equipment should be designed to encourage business to invest in new ideas and not form financial barriers. Such requirements should be funded and not imposed. The need to increase the rate at which these weapons of mass destruction are removed, and this blight on humanity got rid of, is incumbent on all of us.

Note

Bob French runs the *Against Land Mines* charitable trust in Leicestershire, England. He can be reached via www.againstlandmines.org.