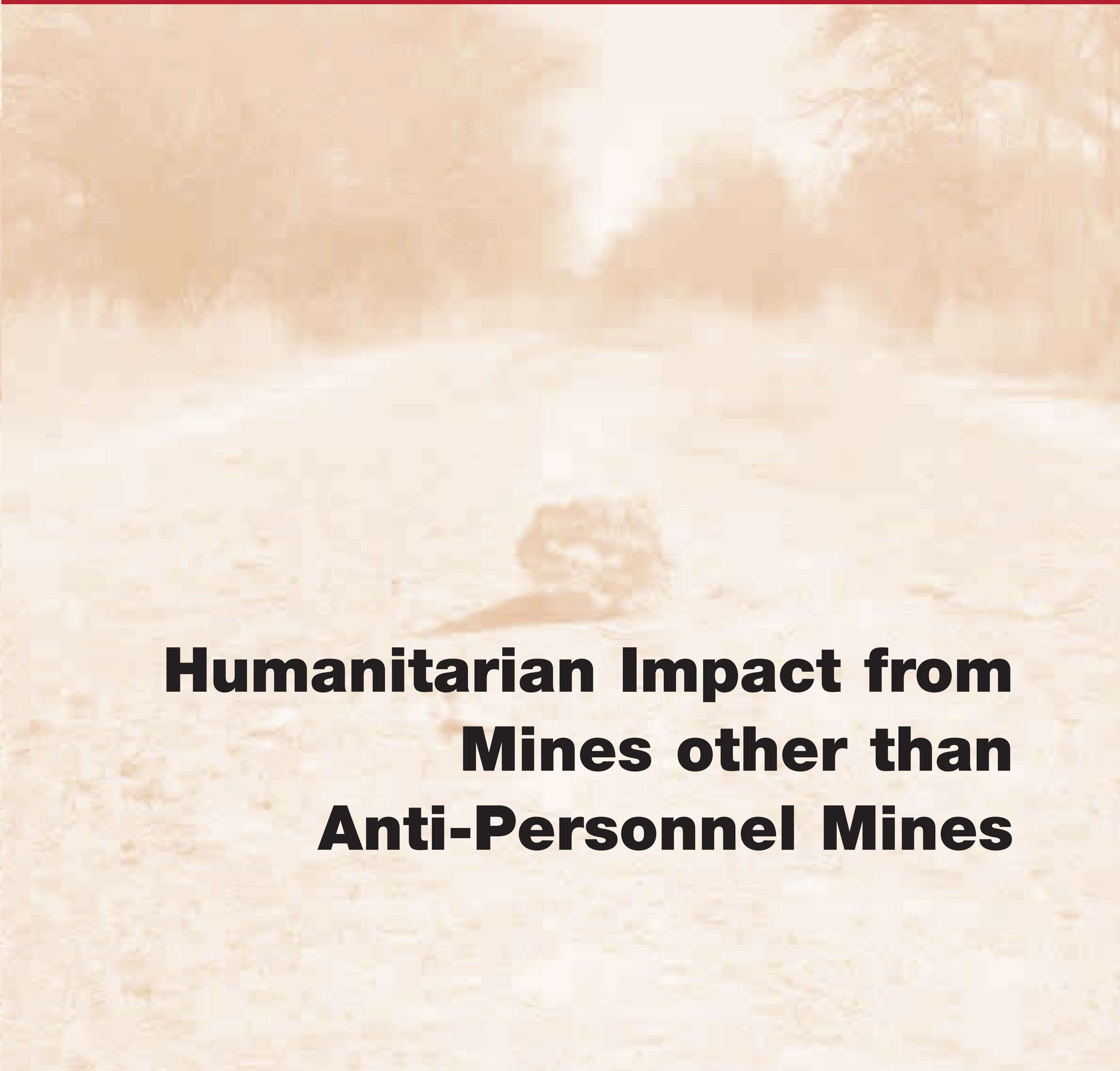

Humanitarian Impact from Mines other than Anti-Personnel Mines

Geneva International Centre for
Humanitarian Demining
Centre International de
Déminage Humanitaire - Genève

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The **Geneva International Centre for Humanitarian Demining** (GICHD) supports the efforts of the international community in reducing the impact of mines and unexploded ordnance. The Centre is active in research, provides operational assistance and supports the implementation of the Mine Ban Treaty.

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Humanitarian Impact from Mines other than Anti-Personnel Mines, GICHD, Geneva, October 2004.

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ISBN 2-88487-035-0

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Acknowledgements

Cover photo: Road in Angola, Province of Benguela. © Vera Bohle.

This report has been written by Richard Moyes, and edited by John Carville.

Foreword

Explosive remnants of war (ERW), including anti-vehicle mines, continue to have a detrimental effect on communities long after conflicts have ended. The mandate of the Geneva International Centre for Humanitarian Demining (GICHD) is to support the international community in reducing the impact of landmines and unexploded ordnance. This report, *Humanitarian Impact from Mines other than Anti-Personnel Mines*, was an initiative of the German and US governments, and is a contribution to the efforts of the international community to address this important issue. It is the fifth in a series of reports published by the GICHD that deal with ERW and their impact on post-conflict societies.

This report aims to provide a wide-ranging understanding of the impact of mines other than anti-personnel mines (MOTAPM) on civilian populations and war-torn societies. As the situation in Angola is symptomatic for many post-conflict societies this case was selected to illustrate the wide range of challenges. The report also summarises the technical responses available to organisations conducting landmine clearance, and identifies some of the difficulties they have encountered in addressing anti-vehicle mine contamination.

The report was funded by the German Federal Foreign Office; their support is gratefully acknowledged. The GICHD is committed to providing technical expertise to the discussion under the Convention on Certain Conventional Weapons (CCW) whenever States Parties require it.

Ambassador Stephan Nellen
Director
Geneva International Centre for
Humanitarian Demining

Executive summary

The humanitarian impact of mines other than anti-personnel mines (MOTAPM) is not restricted to the numbers of people they kill or injure in affected countries. The most significant impact of MOTAPM comes from their blocking access to populations in need, locking them in poverty and denying them external assistance. While other types of unexploded ordnance and improvised explosive devices present a threat to civilians, the specific types of impact caused by MOTAPM blocking access to vulnerable populations is particularly severe.

This report summarises the capacity of the landmine clearance sector to respond to MOTAPM, specifically anti-vehicle mines. It then looks at the humanitarian impact of MOTAPM contamination in a specific environment. A case study illustrates the efforts of humanitarian organisations to address problems faced by rural communities in Angola. These problems persist and are made worse because MOTAPM on roads prevent humanitarian organisations from gaining access to the population. MOTAPM are also seen to increase the cost of humanitarian assistance. The conclusions of the report complement evidence presented by the International Committee of the Red Cross (ICRC)[1] and the United Nations Mine Action Service (UNMAS)[2] that MOTAPM have caused severe humanitarian problems in post-conflict environments.

Main conclusions

Post-conflict societies can experience a wide range of vulnerabilities. The displacement of people away from their areas of origin and the breakdown of economic and social structures leave communities prone to malnutrition, poverty and disease. These problems require urgent humanitarian responses to prevent deterioration and a possible return to conflict.

Where government and local bodies are weak in the aftermath of conflict, international humanitarian organisations are called upon to implement relief programmes in an effort to sustain life and provide a basis for local self-sufficiency. Key areas of activity relate to food security, water, sanitation, shelter and basic health. MOTAPM frequently hinder or prevent access by humanitarian organisations to areas that require their assistance. As a result, humanitarian problems that might otherwise have been resolved become long-term, intractable emergencies.

By denying access, MOTAPM contribute to the "structural vulnerability" of affected communities, those deep-rooted vulnerabilities that cause other problems to persist or to reoccur. The overall cost of implementing humanitarian projects is also increased, meaning that fewer people receive assistance from the money that is available.

The main conclusions of this report are the following:

1. **MOTAPM can worsen the humanitarian plight of a post-conflict country or area at a macro-level — increasing the vulnerability of the local population while decreasing the capacity of external bodies to provide assistance.**
2. **MOTAPM present serious problems for the landmine clearance sector, and no mechanisms exist that can rapidly and reliably remove this contamination. If sophisticated mines, such as those fitted with sensitive fuses (scratch wires, breakwires, magnetic influence, acoustic or seismic mechanisms), become commonly used on the battlefield, then demining operations will be made more complicated.**
3. **The perceived threat of MOTAPM is alone sufficient to block access, and the process of removing the threat can be time-consuming and expensive.**
4. **By blocking access, MOTAPM can trap populations in an emergency situation, denying them the opportunity to progress towards development.**
5. **MOTAPM can block the return of refugees and internally displaced persons (IDPs) to their places of origin.**
6. **MOTAPM raise the cost of implementing humanitarian projects. Where access is not blocked absolutely, it may be possible to deliver aid by longer road routes or by air. However, the increase in logistics costs increases the cost per beneficiary of aid. As a result, fewer people receive assistance out of the funds provided than if anti-vehicle mines were not present.**
7. **Where MOTAPM prevent humanitarian organisations from reaching the intended beneficiaries directly, they can force organisations to distribute aid through third parties without mechanisms for ensuring that assistance reaches the people most in need and without systems for monitoring project impact.**
8. **The presence of MOTAPM means that some communities are not even considered for humanitarian assistance, because their needs cannot be assessed.**

The problems that MOTAPM cause for the work of humanitarian assistance, and the difficulties faced by the landmine clearance sector in addressing this contamination, mean that MOTAPM can present a serious obstacle to post-conflict recovery. While these problems may not all be encountered in every environment contaminated by MOTAPM, they do provide a strong illustration of the significant, negative impacts that MOTAPM have already caused in affected countries, and which may be caused elsewhere in the future.

Introduction

The first Review Conference of the Convention on Conventional Weapons (CCW)[3] in 1996 resulted in the adoption of Amended Protocol II, which contains specific restrictions on the use of anti-personnel mines and general restrictions on the use of all mines. Although some States Parties maintain that Amended Protocol II offers sufficient controls over MOTAPM, efforts have continued to explore the need and options for further legal regulation.

The Second Review Conference of the CCW in December 2001 established an open-ended Group of Governmental Experts (GGE) to address the issues of explosive remnants of war (ERW) and MOTAPM. Working from this mandate, the GGE has seen a range of proposals for the development of further and more effective controls over MOTAPM.[4] Discussions are currently ongoing, with some nations calling for the CCW to adopt a "negotiating mandate". This would move towards agreeing a new, legally-binding instrument specifically addressing the design, use and transfer of MOTAPM, along with related post-conflict obligations.

In light of these discussions, this paper is designed to further inform decision makers regarding the humanitarian impact of MOTAPM and the problems faced by the landmine clearance sector in its efforts to tackle MOTAPM as a post-conflict threat. It establishes the range of responses to MOTAPM contamination that are currently available to landmine clearance organisations. With an understanding of the limitations of these responses, it then looks at the humanitarian impact of MOTAPM contamination, drawing on case-study material from Angola. This impact comes primarily from the threat of MOTAPM on roads.

The present report does not provide an overview of the impact of MOTAPM internationally, but uses the example of Angola to illustrate how MOTAPM cause humanitarian problems. It also draws upon the worldwide experience of GICHD demining experts.

The report is presented within the following structure:

- Section 1 provides a summary of key features of MOTAPM as defined in this report.

- Section 2 summarises the technical responses available to organisations conducting landmine clearance operations in an effort to resolve the problems caused by MOTAPM. It looks at the strengths and weaknesses of different technical responses, and establishes an understanding of the limitations of the mine action sector's ability to rapidly and thoroughly address this contamination.
- Section 3 provides an introduction to the form of contamination from MOTAPM present in Angola. It looks briefly at patterns of MOTAPM use, available information on the location of MOTAPM, and the implications of these factors for civilian and humanitarian traffic in the post-conflict environment.
- Section 4 presents case-study material on the specific humanitarian impacts of MOTAPM contamination in areas of Angola. It demonstrates the implications of humanitarian organisations being denied access to vulnerable populations and shows that MOTAPM contamination increases the cost of aid.
- Section 5 sets out the report's conclusions.

The report is founded on a combination of desk research and field research in Angola, which was conducted in August 2004 by Richard Moyes, a consultant to the GICHD. In particular, it is based upon interviews with humanitarian and landmine clearance organisations operating in Angola, regarding how the ongoing presence of MOTAPM has affected their operations.

Owing to the complex nature of the impact of MOTAPM, little quantitative data is available to provide a comprehensive picture of the problems that MOTAPM cause worldwide. The information presented in this report illustrate the nature of the humanitarian impact of MOTAPM, in particular where they are not able to be cleared or are not automatically rendered safe.

Figure 1. A civilian truck after detonating an anti-vehicle mine in Angola. © The HALO Trust.

1. MOTAPM: anti-vehicle mines

While there is no universally agreed definition of the term, for the purposes of this report the term MOTAPM is restricted to anti-vehicle mines.[5] These mines are primarily designed to be detonated by vehicles, and contain a large explosive charge capable of destroying or incapacitating such targets. Accordingly, MOTAPM are often placed on or adjacent to roads. MOTAPM may be manually emplaced (usually buried under the ground) or they may be "remotely delivered", in which case they will often lie on the surface. Most anti-vehicle mines are of rugged design and will remain operational for decades.

Figure 2. The blast of an anti-vehicle mine detonation can throw a vehicle up in the air. Such violent motions are one of the primary causes of deaths and injuries.

Anti-vehicle blast mines use the blast effect of the main explosive charge in order to incapacitate their target. The main charge is likely to contain between five and seven kilograms of explosive. Light vehicles without armour are likely to be destroyed by the blast. The blast wave will throw the vehicle into the air, and there will be substantial movement of secondary fragmentation through the vehicle as parts closest to the blast are deformed and propelled by the shock wave. Armoured vehicles may suffer severe damage at the point of contact (wheels or tracks), but the vehicle hull is likely to survive. However, occupants can still suffer injuries as a result of the shock wave striking the hull.

Some anti-vehicle mines use a shaped and lined explosive charge to create particularly penetrating explosive effects. By focusing the power of the explosion and forming or using a metal slug, these mines are designed to puncture armour, allowing the blast effect to enter the vehicle. This penetration is an enhancement of the general blast effect of the mine and is designed specifically to counter vehicle protection.

There are a wide range of different mechanisms by which anti-vehicle mines can be activated.[6] The most common mechanism is downward pressure on the top of the mine. Such a mechanism does not distinguish between military vehicles and civilian transport such as tractors, trucks, buses or cars. This means that the mine will present a threat to civilian vehicles if it persists in the post-conflict environment. Other types of anti-vehicle mine fuse may be even more sensitive to activation by lighter vehicles — or even by people.

Some anti-vehicle mines incorporate fuses that can be set to initiate under much less influence than the ground pressure of a vehicle. Sensitive fuses on anti-vehicle mines can be initiated by contact with, or the proximity of, personnel. Sensitive fuses on anti-vehicle mines include pressure activation, tripwires, tilt rods, scratch wires, magnetically influenced, and acoustic/seismic activated devices. The ICBL considers that anti-vehicle mines adapted in this way are anti-personnel mines, and should be prohibited accordingly by the Anti-Personnel Mine Ban Convention.

Figure 3. MK 7 anti-vehicle blast mine, fused with tilt rod. © German Armed Forces.

There are many features and characteristics designed to "protect" MOTAPM. Anti-handling devices may be built into the mine, or the mine can be set with common features, such as firing devices or activators. Anti-removal fuses designed to complicate military countermine clearance can also be built into the primary fuse. Often, there is no obvious indication for the potential application of anti-handling devices. Some of them have a secondary feature that allows the deliberate modification of the mine for anti-handling purposes.

Most of the firing devices work on the same principle. They are activated by the release or application of light pressure, or the application or release of pressure.

Figure 4. Two types of anti-vehicle mines found in Angola.

2. The impact of MOTAPM on mine clearance

Currently no methodologies allow mine clearance organisations to rapidly and reliably identify areas contaminated by MOTAPM. Potential new technologies show no signs of improving this situation in the near future. The primary methods of landmine clearance are manual demining, the use of machines and the use of scent-detectors (most commonly dogs). Different approaches may be used in combination in order to improve the rate and quality of clearance. However, all of these approaches are limited in their capacity to remove MOTAPM contamination rapidly, which reduces the capacity of landmine clearance operations to improve clearance rates by combining methodologies.

In Angola, for example, one landmine clearance project was asked to clear a road that was not being used owing to suspected anti-vehicle mine contamination. The project took four months to clear 37 kilometres of road at a cost of €600,000 (approx. US$740,000). Not a single mine was found in the process.

Basic requirements of mine clearance equipment

Many post-conflict environments affected by landmine contamination are characterised by difficult climatic conditions, social and political instability, low levels of education and health among the population, and a poor road network and general infrastructure. Equipment for use in humanitarian landmine clearance operations needs to be appropriate to such conditions. In particular it should be:

- **robust:** the equipment needs to be of solid construction in order to withstand the strains of use in difficult environments and to reduce requirements for repair where materials and skills may be limited;
- **simple:** where levels of education among the local population are low, simple equipment can be used more effectively and maintained more reliably;
- **cost-effective:** mine clearance operations have to be implemented within limited aid budgets;
- **flexible:** the equipment will usually need to be used against various types of mine and on varying terrain.

Nature of mine contamination

Most of the post-conflict environments in which landmine clearance has been undertaken have included unmarked and unrecorded minefields. Even where minefields have been previously marked, it is common for markings to have been stolen, destroyed during conflict or simply to have deteriorated over time. Where minefields were recorded, these records may only have been partial, they may have been lost, or additional mines may have been subsequently laid in the area. The lack of information on the location of mines in Angola, which is looked at later in this report, has parallels in most other post-conflict environments.

In such circumstances, a key role for landmine clearance organisations is to locate suspect areas through survey operations. Where MOTAPM contamination is suspected on roads but information on the precise location of this threat is limited, mine clearance organisations are presented with a particularly complex problem that is likely to require slow and costly processes if it is to be thoroughly addressed.

MOTAPM and manual mine clearance

Manual mine clearance, relying primarily on metal detection and prodding, is a slow process and is not capable of clearing large areas of ground in short periods of time. An average clearance rate, depending on conditions, would be between 10 and 20 square metres per deminer per day. In ideal conditions, the rate might increase to 50 square metres, but safe operations are unlikely beyond that point. No technological improvements appear likely to greatly increase the speed of manual demining in the immediate future.

An additional difficulty for manual demining of roads is the constricted workspace available to the deminers. While the overall area to be cleared may be large, the area that can be accessed by deminers is narrow, reducing the amount of labour that can be practically applied to the task. Operations that have undertaken manual clearance of roads have proved to be slow and expensive.

Most mines have a small amount of metal within them, which is identified by the detector. The more metal content there is within a mine, the easier and safer it is to clear. If the operator knows an area contains only mines of a higher metal content, it is possible to increase the speed of operation by making the detector less sensitive to false alarms resulting from contamination by other metal objects.

The same principle applies to MOTAPM. Greater metal content can allow for faster rates of clearance. However, while a specific project may be focused on clearing MOTAPM, it must be implemented in accordance with the same procedures used for finding anti-personnel mines — unless there is very strong evidence that no anti-personnel mines are present.

Anti-handling devices, low metal content and MOTAPM with particularly sensitive fuses all further reduce the speed at which manual demining can proceed.

Manual demining still has a vital role in the clearance of MOTAPM. Although not capable of verifying or clearing large areas quickly, metal detection does permit the precise location of mines.

MOTAPM and mechanical mine clearance

Since the start of humanitarian demining 15 years ago, mechanical systems have been used to support operations and have shown a capacity to significantly increase the rate of clearance. In optimal conditions (low metal content of the soil, little vegetation, no low metal content mines), experience has shown that a team of eight manual deminers can only clear up to 400 square metres a day. However, mechanical systems such as the Minewolf [7] are capable of clearing approximately 7,000 square metres a day.

Figure 5. The power of anti-tank mine detonations is too great for most mechanical clearance systems to withstand without substantial damage. Mineguzzler. © Bofors.

The latest *Mechanical Demining Equipment Catalogue* published by the GICHD[8] provides information on 35 different mechanical systems. Few of these are strong enough to withstand the forces of a MOTAPM detonation without suffering major damage. Even if there is no critical damage to the machine, experience has shown that the required repairs are expensive and time-consuming, resulting in an unacceptable strain on the budgets of clearance organisations.

Systems have been developed that, owing to their size and mass (approximately 40–60 tons), are capable of withstanding multiple MOTAPM detonations without major damage. Examples are the Minebreaker 2000/2 (*see Figure 5)* and the Rhino. Both of these systems were developed in Germany.

Figure 6. Systems that can withstand MOTAPM detonations are often too difficult to operate in post-conflict environments. Minebreaker 2000/2. © FFG.

Practical use, however, has found such systems unsuitable for use in humanitarian demining in most operating environments because:

- **purchase costs** of around €1.5 million to €2 million (approx. US$2 million to US$2.5 million) are too high for most demining organisations;[9]
- **running costs** (fuel, oil, spare parts, cost of transportation) are also prohibitively high, making it difficult to operate the equipment in a cost-efficient way. Fuel consumption of between 50 and 100 litres per operating hour,[10] producing a weekly consumption of up to 3,500 litres, is expensive and requires significant logistical support, which can be difficult in post-conflict environments;
- **infrastructure** is often weak in developing countries. The load capacity of roads and bridges is usually insufficient for carrying equipment with a weight of 40–60 tons;
- **technological complexity** makes repairs difficult in the field.

Most machines that are appropriate for use in post-conflict environments cannot withstand MOTAPM detonations. As a result, such machines do not provide an effective mechanism for rapidly clearing MOTAPM contamination. Furthermore, because of the risk of extensive damage to such valuable project resources, such machines may not be used for the clearance of anti-personnel mines where a MOTAPM threat is present. This means that the increased clearance outputs available from mechanical applications cannot be realised. Mechanical systems, such as flails or tillers, will also cause serious damage to road surfaces, further reducing their applicability where mines on roads constitute a major component of the MOTAPM threat.

MOTAPM and scent-detectors

Scent-detectors for mine detection identify specific odours produced in the event of contamination by mines or explosives. Dogs have been the most commonly used scent-detectors in landmine clearance, although work is being undertaken with other animals, notably rats. No man-made scent-detection systems are currently operationally available.

Scent-detection systems search faster than manual deminers. However, the rate at which ground is covered influences the reliability of detection. If a dog is to detect mines reliably, it must move slowly. If temperatures are low, the ground is wet, or soils are high in clay content, it will have to move even more slowly, because detection is more difficult under such conditions. Environmental conditions in some areas make dogs and other scent-detection systems very difficult to use.

Where MOTAPM have tripwire, breakwire, tilt-rod-activated or other sensitive fuses, dogs cannot be used as it is generally agreed among experts that specific training would be too complicated.

Certain types of well-sealed, metal-cased anti-vehicle mines have been found to result in a low-availability of scent.

With animals, reliability of detection is improved using multiple animals over the same area. This increases the time taken to search land. Furthermore, despite the acknowledged effectiveness of dogs for mine detection, some countries require that dogs be used in conjunction with other mine-detection or clearance techniques. For example, in Croatia, dogs must follow mechanical systems. Such a process cannot be employed where the MOTAPM threat limits the use of machines (as described above).

Some methodologies transfer odour from the minefield to animals using a filter. This concept, generically known as REST (Remote Explosive Scent Tracing), was originally used in the early 1990s by South Africa (as MEDDS — Mechem Explosive and Drug Detection System) and has recently been employed in Afghanistan and Sudan.

This process does not locate mines, however, but is used to eliminate areas that contain no explosives. Where machines cannot be used owing to MOTAPM contamination or because of the damage they would cause to the road surface, final location of the mines after REST has been employed needs to be done by other means.

This may be done by manual clearance — for which detectable metal content is of critical importance — or by dogs in cases where there are no sensitive fuses and mine casings do not result in low availability of scent.

New technologies

It has been suggested within the CCW that there is no need for an obligation for MOTAPM to contain sufficient amounts of metal to make them detectable, because the development of future clearance technologies will supersede metal detection as the principle mechanism for locating mines.[11] Organisations involved in humanitarian landmine clearance operations have repeatedly rejected such a position. Indeed, at the GGE meeting of the CCW in March 2004, UNMAS reiterated:

> *"Despite significant investment in technology research and development, metal detection, dogs and machines are still the most applicable options for humanitarian mine clearance. New techniques at present do not promise quick results, if at all. They all have some strengths, but many limitations for the clearance of MOTAPM. Most of them remain at a prototype stage and their use in the field is not yet foreseeable."*[12]

Institutions that support investment in innovative detection technologies expect progress in this area to be slow and expensive. Even with such investments, there is currently no assurance regarding the effectiveness of the outputs that may be produced. The RAND Science & Technology Policy Institute (2003) has concluded that research should be pursued into new detection methods using a multi-sensor array with advanced signal processing to allow for synthesis of sensor data. It estimates the cost of such research and development to be approximately US$135 million over 16–19 years.[13] It is not known how effective the output of this process would be or whether it could be produced at low enough cost to make it generally applicable within humanitarian landmine clearance.

Furthermore, advanced detection systems, if and when they become available, are likely to be deployed within military operations before being used within the humanitarian sector (which may never be possible on a large scale if the costs are prohibitively high). In such circumstances, this development would make mines detectable within military operations but not under the commonly available technologies available to humanitarian landmine clearance organisations.

As noted at the beginning of this section, humanitarian landmine clearance operations need equipment that is robust, simple, flexible and cost-effective. As well as being technically effective, any new technology will also have to be appropriate to the working conditions of landmine clearance in the field.

Figure 7. Multi-sensor detection system.

3. The MOTAPM threat in Angola

The impact of MOTAPM in Angola has been highlighted to the CCW in previous reports, notably by UNMAS.[14] The case of Angola provides a valuable illustration, because it is indicative of the potential for MOTAPM to cause serious humanitarian problems where there is a lack of record-keeping among parties to the conflict and where the mines used contain no inherent technical measures to reduce their post-conflict impact.

Figure 8. Map of Angola

Since the ceasefire of 4 April 2002, there has been a growing realisation of the full extent of the problem of anti-vehicle mine contamination in Angola. As general security improved in the wake of the ceasefire, new areas and roads became accessible. This expansion in humanitarian access was quickly curtailed, however, as anti-vehicle mine accidents to civilian vehicles and international organisations forced a recognition of the threat.[15] Accidents and the ongoing discovery of anti-vehicle mines on roads have forced humanitarian organisations to make efforts to ensure the security of their staff. In turn, this has led to systems being put in place to classify roads in terms of the risk they are believed to present — resulting in much of the road infrastructure being considered unsafe for use unless assessed otherwise. Because available information is limited, even roads assessed as "low risk" may contain anti-vehicle mines, and there have been numerous instances of mine accidents occurring and mines being found on roads that had previously been open to humanitarian traffic.

Anti-vehicle mines have continued to cause accidents on a regular basis. The United Nations Development Programme (UNDP) recorded 41 anti-vehicle mine accidents in 2003, resulting in 22 people killed and 110 people injured. A further 14 anti-vehicle mine accidents have been recorded in the first eight months of 2004, with 22 deaths and 41 injuries to civilians and humanitarian workers.[16] These figures highlight the capacity of anti-vehicle mine accidents to produce multiple casualties. In addition, there have been numerous instances in which anti-tank mines were found without accidents occurring. Such discoveries can also result in roads being closed to humanitarian use.

Types of MOTAPM

The most common types of anti-vehicle mines found in Angola are pressure-activated blast mines. A list of anti-vehicle mines found in the country is presented in Annex 1 to this report. Many of these mines have a low metal content and are considered difficult to detect. It is most notable that none of the anti-vehicle mines listed here were produced in Angola. Most were manufactured in the former Czechoslovakia, the former Soviet Union, the US and the former Yugoslavia.

Anti-vehicle mines were generally laid as part of barrier defences around towns, and to protect checkpoints and other strategic sites such as bridges. They were often laid in bands across roads, with mines being placed on the surface and verges of a road as well as on the land to the sides of it. Anti-vehicle mines were also used in ambushes and to disrupt the movement of troops or supplies. As a result, there are certain locations where an anti-vehicle mine threat can be expected, and then there is a less defined threat on areas of road between population centres. These areas may be evidenced by destroyed vehicles that remain in place from the conflict, but such evidence is not always present. There was no effective recording or marking of minefields, and over the extended period of the conflict any markings that were used would likely have deteriorated.

Availability of information on the location of MOTAPM

The lack of record-keeping by either of the parties to the Angolan conflict makes the task of addressing anti-vehicle mine contamination significantly more problematic. Unless the actual people engaged in laying mines in a particular location can be contacted directly, the available information is likely to be vague. Even where good information on specific mine-laying activities can be found, the shifting lines of the conflict mean that additional mines may have been laid in the area at a subsequent point. In an assessment of the route from Cangala to Cangote, the information available from one of the parties to the conflict ran as follows:

> *"The road and villages were used and controlled by government forces but UNITA made numerous attacks from the surrounding bush. ... UNITA confirm that they did lay mines on the road to disrupt government convoys. UNITA sources are not able to say how many mines were laid or where. There have been two accidents along the road."*[17]

Figure 9. Destroyed tanks suggest a history of ambush activities and might indicate the presence of anti-vehicle mines. © Vera Bohle

In cases where anti-vehicle mines may also pose a threat between towns and villages and may not be part of the local collective memory, it is harder to find reliable local sources of information. The United Nations Mine Action Service (UNMAS) has noted that such lack of information means that suspect areas cannot be substantially reduced through survey processes, resulting in larger areas having to be cleared by demining organisations.[18] On a macro level, this lack of information — and the unreliable nature of the information that is available — often results in whole routes having to be considered suspect.

Lack of information on the location of MOTAPM that have been laid makes the overall management of the MOTAPM threat far more difficult.

Such a lack of clear information greatly increases the risk of anti-vehicle mine accidents in the post-conflict environment. Universalisation and effective implementation of CCW Amended Protocol II, while perhaps not sufficient in itself, would enhance protection to the post-conflict population. The situation in Angola also illustrates the fact that where systems of recording and information transfer fail, there are no technical measures to reduce impact.

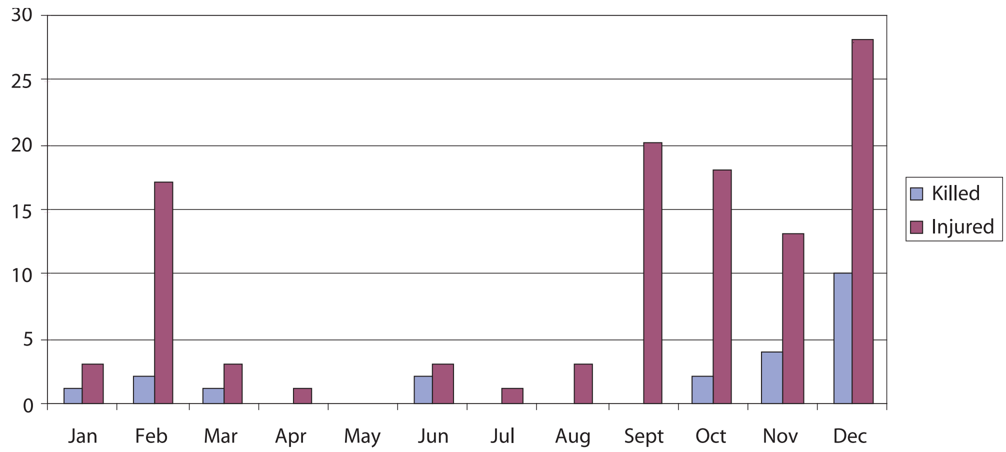
Where a conflict is long-running and has shifting lines of control, the ability to maintain records and the priority afforded to such a process are likely to be minimal. Troops are moved to different locations, taking with them their knowledge of mine-laying in the area they leave behind. Over long periods, minefield fences — if used — will deteriorate, owing to fighting, theft or environmental conditions. All of these factors highlight how record-keeping and marking of minefields cannot be relied upon to stop anti-vehicle mines causing humanitarian problems in the post-conflict environment.

Given the reliance by the Angolan government and UNITA on externally produced anti-vehicle mines, the humanitarian problems now being experienced would have been significantly reduced had the mines contained technical characteristics to limit their persistence and to enhance their detectability.

Accidents resulting from MOTAPM

Pattern of accidents

Figure 10. Recorded anti-vehicle mine casualites in Angola in 2003 by month



As Figure 10 shows, a higher incidence of anti-vehicle mine accidents is found in the wet season (approximately October to March):

- During the dry season, the baked hard soil hinders the transfer of pressure onto the mines, and good driving conditions make it easier for vehicles to stay on the well-used tracks of the road.
- During the wet season, pressure is transferred more easily onto the mines. Rains may also wash away topsoil, bringing more deeply buried mines closer to the surface.[19]
- When vehicles get stuck on the road, other vehicles drive onto the more dangerous road margins or verges in order to get around them.

These seasonal variations result in a changeable situation. Roads may be subject to considerable traffic for a while, only for an incident to occur and force a reconsideration of the safety of the route.

In the accident shown in Figure 11, seven people were killed when a civilian taxi-bus hit an anti-vehicle mine when using an alternative route to avoid a collapsed bridge near Kuito town. A military truck followed later and struck a second anti-vehicle mine while driving around the destroyed taxi.

The overall road infrastructure in Angola is in very poor condition, which is in itself a significant barrier to humanitarian access. This problem is exacerbated by the general threat of both anti-vehicle and anti-personnel mines. Mines are often found on the diversions that would allow bridges to be bypassed. Where a bridge has been destroyed during the conflict, there is a high threat of mines in the surrounding area, which makes it difficult to establish alternative river crossings (such as ferries). As a result, it is difficult to work around the problems presented by the poor condition of the infrastructure.

Figure 11. Consecutive anti-vehicle mine accidents close to Kuito, Angola. © The HALO Trust.

UNMAS has noted that anti-vehicle mine contamination has impeded the reconstruction of the road infrastructure.[20] However, road renovation can itself increase the anti-vehicle mine threat. Road construction programmes may widen roads, making previously unused road margins part of the road surface. While anti-vehicle mines may already have been removed from the road surface (or destroyed through accidents), the mines on the road verges or to the sides of the road may remain in place. Mines have been found in the wake of road-widening programmes, and roads subject to such programmes need to be reassessed in order to determine the threat that they present.

Civilian and NGO traffic: different responses to risk

Humanitarian organisations accept a responsibility not to expose their employees to unacceptable levels of risk.[21] Such organisations therefore have to evaluate the risk of using specific roads and plan and implement their operations on that basis. Local populations may not follow the same risk assessment, resulting in populations living in areas that humanitarian organisations cannot access.

In Angola, anti-vehicle mines continue to be found or cause accidents on roads that have previously seen significant levels of traffic. Even after such accidents, civilian traffic may continue to use the road, despite the clear indication that a risk is present. Thus, while the local population may continue to use certain roads even when a threat has been indicated, employees of humanitarian organisations are unable to continue using the route until the risk has been formally reassessed and technical measures have been taken to address outstanding problems.[22] In some locations, the situation can be exacerbated by local authorities advocating the use of roads that humanitarian organisations do not consider safe.[23] Such divergent perspectives can complicate support to returning IDP or refugee populations, by promoting their movement into areas where international organisations cannot provide assistance.

Figure 12. A truck contracted to move food for a humanitarian relief programme after striking an anti-vehicle mine. © The HALO Trust.

Information management and risk assessment

Efforts to manage the threat from MOTAPM in Angola rely primarily on processes of information management and risk assessment. The importance of cooperation and communication between those implementing humanitarian operations and the military authorities who can provide advice on the safety of different routes has been emphasised within the CCW GGE discussions.[24] In many post-conflict environments, particularly where government capacities are weak in the aftermath of conflict, it falls to humanitarian mine clearance organisations to fulfil the role of advisers to the humanitarian missions.

In Angola, the UN Security Coordinator (UNSECOORD) manages the overall designation of routes as useable or not useable on behalf of the UN family. All UN bodies must accord with the advice provided by the UNSECOORD. Most international humanitarian organisations also follow the UNSECOORD advice, though others may establish higher or lower thresholds of risk for their operations.[25] With respect to anti-vehicle mines, the UNSECOORD designation is usually based on a positive or negative assessment of a route by a humanitarian landmine clearance organisation.[26]

The designation of routes as "low risk" or "dangerous" is the central mechanism by which the threat of MOTAPM is managed by humanitarian organisations. This mechanism seeks to synthesise available information so as to provide advice that will allow accidents to be avoided. There is no guarantee that the route assessments are accurate. Full landmine clearance, however, is too slow and expensive to allow all roads to be cleared in advance of their being used.

4. The humanitarian impact of MOTAPM in Angola

"The catchment for our project [health posts, food security work] is about 28,000 people but the area to the north is not accessible. We don't know how many people are to the north, it could be another 5 or 10,000." (Medair, Angola, regarding anti-vehicle mines restricting access to target populations in Moxico Province.)

"I do the above with hesitation given the humanitarian consequences. Firstly, I shall discuss with [the World Food Programme's — WFP — local implementing partner] about our decisions and whether they wish to continue with food distribution in Ndiema and Lomba Ponte. If not, it means that about 12,000 people will arrive in Mavinga which already has a serious water quality problem (shigella, etc.), and has an extremely serious [anti-personnel] mine problem and lack of de-mined space to house newcomers. ...

... Secondly: it means the communities in Likua and Rivungo will be cut off from food and health aid, and they face the most serious problems in the province that I have seen so far. I have discussed with WFP the possibility of sending a team in by helicopter and doing food drops by Hercules (we did this successfully in the past in Sudan and Somalia) with a 3 month ration. I await the outcome." (Excerpt from correspondence of 8 December 2002 relating to the decision to declare certain roads in the Mavinga area of Cuando Cubanga Province closed to UN traffic. This was in response to two separate anti-vehicle mine accidents involving Médecins sans Frontières and ICRC vehicles, one of which resulted in the death of seven national staff members of a polio vaccination team.)

"The commune of Chilata is 64km from the administrative center of Longonjo, and holds a population of about 36,000 inhabitants, according to the vulnerability studies and report released by WFP this is one of the most vulnerable communes in Huambo Province. It does not have access to hardly any basic services, at the moment the population is surviving on unripe sweet potatoes plus some few items distributed by WFP. [We] will implement food security programs in this area, however, donors are reluctant to finance projects where they have no possibility to visit. Some of the activities planned are: seeds and tools distribution, construction of agriculture cooperative, training to farmers associations, seed multiplication, training of animal health agents, establishment of an animal traction bank etc. ...

... We eagerly trust that the plans to carry out the mine clearance of this road will be executed soon and smoothly, bringing about positive changes in the commune of Chilata." (Excerpt from correspondence received by the HALO Trust, requesting assistance to address suspected anti-vehicle mine contamination making access roads unusable.)

"The presence of [anti-vehicle] landmines continues to be a major obstacle, and has resulted in areas in great need being cut off from project staff. For example, during much of [financial year] 2004, the road between Kuito and Huambo was closed due to mine-incidents, and CARE project activities in Chinguar were reduced or relocated elsewhere [the CARE project in Chinguar was providing assistance to some 80,000 people]....[27] *In December 2003, a landmine accident in Chipeta, along the main road that has been open ... for two years, killed six CARE workers and reminded us of the great risk development workers run in the line of duty."* (CARE reporting on the impact of anti-vehicle mines on their operations in Angola over the previous 12 months.)[28]

The primary impact of anti-vehicle mine contamination in Angola is that it restricts the scope and increases the cost of essential projects relating to:

- food security,
- water and sanitation, and
- basic health.

As a result of anti-vehicle mine contamination, many vulnerable civilian populations are receiving no assistance from humanitarian organisations. Assistance has been directed towards less vulnerable populations, because the communities most in need cannot safely be reached. The overall cost per beneficiary of humanitarian projects has been increased, resulting in fewer people receiving assistance out of the money provided.

Access

The World Food Programme's vulnerability analysis system considers two key levels:

- **Structural vulnerability**: this includes demographics, economic activities, agriculture, access to basic services and infrastructure. These are the underlying structures upon which communities are dependent. Structural problems are deep-rooted and will cause other problems to persist or reoccur if they cannot be addressed.
- **Current vulnerability:** this encompasses population movement, agricultural seasons, food production, market prices, malnutrition and current health conditions. These are immediate circumstances and may be conditioned by the deeper-rooted structural vulnerabilities noted above.

Within such a framework, structural vulnerability is the basis for persistent economic weakness. The WFP has stated that "*in terms of infrastructure, the rehabilitation of access to isolated areas is* condicio sine qua non *for the way out of extreme (structural) poverty*".[29] That is to say, access is fundamental to alleviating extreme and structurally rooted poverty.

The European Community Humanitarian Office (ECHO) is one of the largest donors to humanitarian projects supporting the needs of vulnerable rural populations in peripheral areas of the country. These projects are implemented by international humanitarian organisations. ECHO's priorities have been water and sanitation, food security and primary health. These are fundamental forms of life-saving humanitarian assistance for the most vulnerable populations. The projects ECHO funds have been clearly affected, however, by changing patterns of access due to anti-vehicle mine contamination making it impossible to reach target populations. ECHO suggests that some 90 per cent of its projects in 2003 were affected by difficulties with gaining access to the target populations.[30] The extent of this problem led ECHO to fund demining activities with a particular focus on securing access. The problem of access, then, is prevalent among humanitarian organisations working with peripheral rural communities.

Almost all humanitarian interventions must be preceded by an assessment mission to establish the planning and funding basis for the project.[31] If an area is not accessible because the access roads have not been declared passable, then populations in that area are often not even considered for assistance. Anti-vehicle mine contamination prevents access to affected communities, putting populations beyond the reach and sometimes out of sight of humanitarian interventions.

These issues result in a continuation of "emergency" conditions at a time when humanitarian organisations are seeking to move towards development assistance. In an official document, the European Commission states that "*despite the improvement in the humanitarian situation,* ***pockets of emergency continue to exist, particularly in areas inaccessible to humanitarian organisations*** *and where large numbers of IDPs are returning without adequate assistance or access to basic services*".[32] Anti-vehicle mines are a key cause of humanitarian organisations not being able to access populations.

- **Huambo Province**

This section provides an illustration of the specific problems that such denial of access can cause. In particular, it looks at the forms of assistance humanitarian organisations saw as being required in certain areas of Huambo Province, and how anti-vehicle mine contamination affected their capacity to provide such assistance.

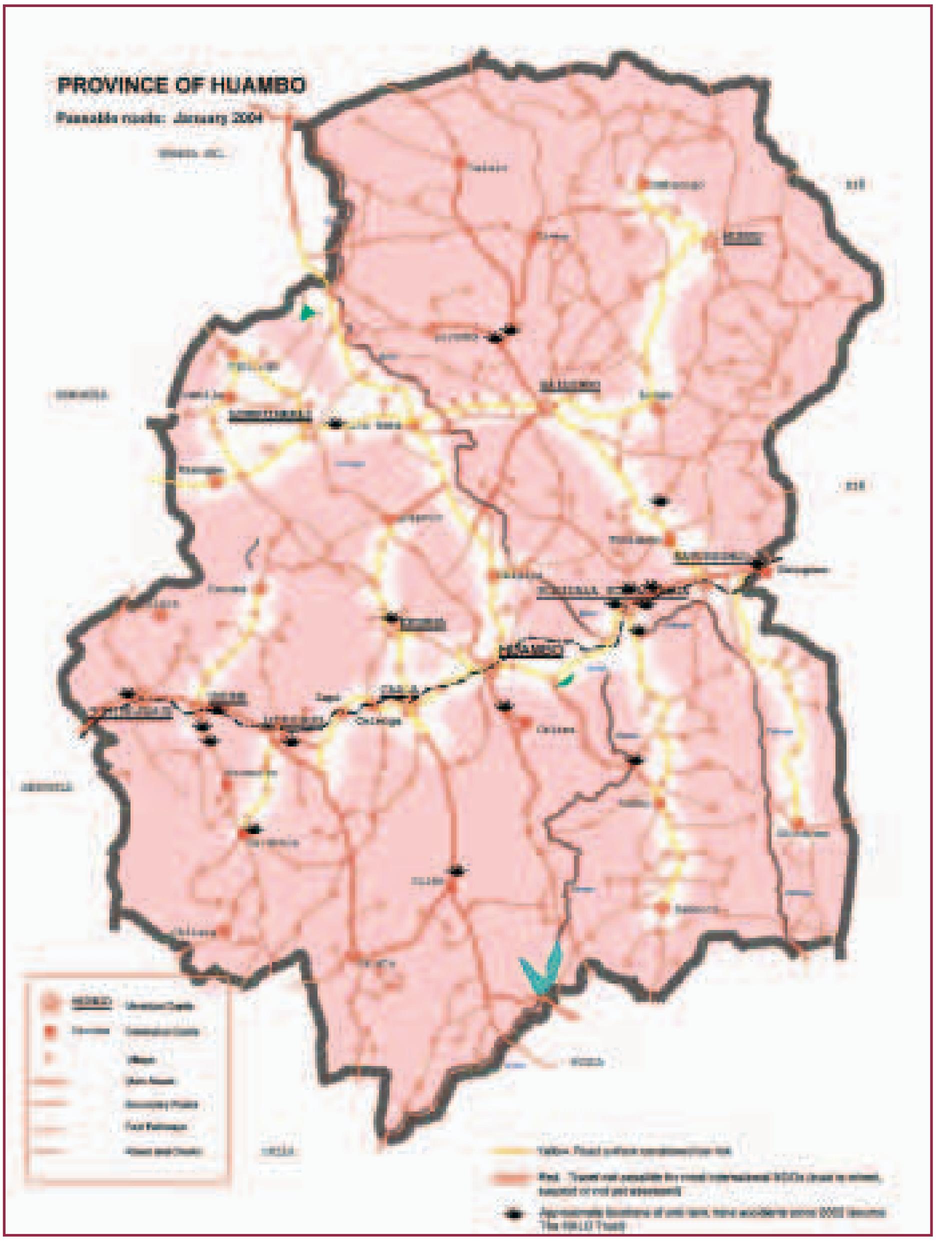
Huambo Province is situated in the elevated *Planalto* region in the central-west region of Angola. It was the epicentre of the Angolan civil war, and saw fierce fighting and widespread displacement among the civilian population. Prior to the conflict, however, Huambo was considered the "granary of Angola", with fertile land and productive maize plantations.

In a National Vulnerability Assessment of June 2003, Huambo Province was considered to contain the highest number of food-insecure and highly vulnerable people in the country (VAFAWG, 2003). Owing to the anti-vehicle mine threat, approximately 159,000 people live in communes that contain no routes passable for humanitarian organisations, and a further 74,000 live in communes that have no passable route to the commune administrative centre.[33] The Survey Action Centre has noted that some 143 communities were inaccessible to the landmine impact survey process in the province, owing to the threat of anti-vehicle mines on access roads.[34]

The map in Figure 12 has been developed from the security assessments undertaken by UNSECOORD on the basis of evaluations by mine action organisations. The yellow routes are those that were considered "low risk" in January 2004. Though none of these roads are guaranteed as safe, they are considered to present a low enough risk to be usable by humanitarian teams.

As can be seen from the map, with few tertiary routes considered sufficiently safe most rural villages are inaccessible to humanitarian organisations. Some “low risk” routes exist in isolation, since intervening roads, previously considered passable, have subsequently presented evidence of anti-vehicle mine contamination — either through mines being found or accidents occurring. These can be seen in the west of the province, near the towns of Ukuma and Longonjo. Such isolated routes, although formally open, could not actually be used by international humanitarian organisations at this time, because they could not be reached from the provincial capital.

Figure 13. Example of a road risk assessment map



The map also shows the approximate locations of anti-vehicle mine incidents since 2002. These incidents alone resulted in at least 36 people being killed and 67 injured. Although the central theme of the present report is to emphasise the broader impact of MOTAPM, these figures nevertheless represent a significant number of casualties within a single province over the course of only two years.

- **Sambo and Samboto communes**

Sambo and Samboto communes are located in the southeast of Huambo Province. These communes provide a useful example, because they had been accessible to humanitarian organisations for a short period in 2002 — until an anti-vehicle mine incident closed the primary access route to the area. The communes held quartering areas for UNITA troops who were being demobilised. The quartering areas were designed to provide support to demobilising troops, such as food and basic supplies, while preparations were being made for their repatriation back to their areas of origin. Large numbers of people had been displaced away from the area during the conflict, and these people started to return to the area with the improvements in security following the end of the conflict. As a result, the population rose rapidly from a very low level to around 62,000 by September 2003 and continued to rise. The population of the two communes is now estimated to be around 120,000.[35] This rising population placed a great strain on available resources, exacerbating food insecurity and overstretching water and sanitation facilities. The returnee population had to try to establish an agricultural base from nothing (though lacking sufficient seeds and tools), while the demobilised soldiers were heavily reliant on external assistance.

Humanitarian organisations had undertaken assessments and planned interventions — and in some cases had started implementing the latter — before the anti-vehicle mine accident revealed the threat involved in accessing the area.

Food security

Save the Children UK conducted an evaluation of conditions for people in Sambo and Samboto prior to these areas becoming inaccessible to humanitarian organisations owing to anti-tank mine contamination. It stated that:

> *"Food aid constitutes the major source of food for households. ... Some vendors in the market were not willing to sell their goods for cash but wished to barter for other food types. If the provision of food aid reduced or access was difficult delaying food distributions, there is no doubt that the population would suffer greatly because there are few other strategies for survival open to them."*
>
> *"Some seed is available for those who have some resources and small plots of land are being cultivated. ... These plots will help supplement the food aid in three or four months but only about 25% of families are cultivating (because the remaining 75% do not have access to seed/tools)."*
>
> *"Food distributions are the lifeline for 33,000+ people in the QFA [quartering area for demobilising troops] and suspension of delivery and distribution is a major concern. The absence of livestock and limited agricultural opportunities give few alternatives to complete dependency on food aid at least in the short and medium term."*
>
> *"There is obviously a major need for seed and tools to enable people to cultivate. This will reduce their dependency on food and widen the food basket to improve their nutritional intake. The health situation and overall security situation in the camp will remain in doubt unless food security is enhanced. An emergency health programme cannot work in isolation of food security."*

> *"While the short-term picture for the population in Sambo QFA is bleak, the medium term picture does not look too bright. Only a small proportion of the population will have food to consume from March/April – and this will only last 2 to 4 months and even less if shared between families. Many families are completely dependent on food aid and this will continue unless agencies are able to give some basic livelihood support. Livelihood assets are few and far between."*[36]

Discussing food security in Nhani village, in the same commune, the assessment report stated that:

> *"Many households in the village do not have 'ration cards' and are therefore not receiving any food aid assistance — it appears that the limited wild foods available constitute the majority of their diet. For those households that do have a ration card the distances involved in collection of the food may be too great to make the trip worthwhile during the rainy season. It was reported that 'people had died' on the road returning to Nhani from Sachitemo following the last distribution."*

This assessment represents a clear statement that humanitarian assistance was urgently required in the area.

During the wet season, an anti-vehicle mine accident on the only practicable access road killed 10 people and injured a further 13. The local military were not able to provide assurances that there were no further mines in the area, and as a result the road had to be classified "dangerous".

Save the Children had been using its own funds to assess the situation as a precursor to establishing food security and health operations. The sudden denial of access to the local population meant that it was unable to secure external funding to work in the area. The organisation pulled back all of its teams and stopped its activities.

Although Save the Children did start going back in 2003, using a longer and physically inferior road, access continued to be a problem. This road, unlike the road that was closed due to anti-vehicle mine contamination, was impassable in the wet season. The wet season, running from approximately October to March, is typically the leanest time of the year for rural populations, who harvest their primary crops at the beginning of the dry season.[37] Access was established only to the municipal centres, so distribution of food to the surrounding rural population relied on local networks and could not be done with any external monitoring or impact assessment. Save the Children estimates that of around 60,000 people in Sambo Commune, only around 2,000 actually live in the municipal centre.[38]

The isolation of these communities has an impact on the structures of responsibility and accountability within local administrative bodies, the police and the military.[39] After years of war, these bodies lack both resources and systems. In Sambo and Samboto areas, there are ongoing tensions between the established population and recent returnees, as well as tensions between the "external" municipal administration and local traditional structures with respect to land ownership and distribution.[40] Isolation, lack of accountability and tension between local administrative authorities have implications for the confidence with which aid can be delivered "remotely" through local networks. The lack of follow-up and monitoring mechanisms where aid is to be delivered through local networks also causes problems for securing donor funding. Donors are wary of committing resources to projects where it is known from the onset that monitoring will be weak and where they themselves may not be able to visit the beneficiary populations.

Sambo and Samboto went into the 2003–2004 wet season more vulnerable than most other areas, owing to their being denied planned assistance because of MOTAPM contamination. Heavy rains further took their toll on crops, as was described in a report by the UN Office for the Coordination of Humanitarian Affairs (UNOCHA):

> *"Results from a rapid assessment conducted by FAO, WFP, FEWS and NGO partners on the impact of rainfall on crops in Huambo province indicate that at least 60 percent of the maize harvest and 75 percent of the beans crop in certain southern Huambo municipalities were lost. In some locations, such as Tchicala Tcholoango [which contains Sambo and Samboto] and Katchiungo municipalities, 90 percent of both crops were destroyed. Even without the unforeseen destruction from the rains, a shortfall of 50 percent in these crops was expected in the province. Crop destruction of 70 percent or above is considered extreme, and in the case of already vulnerable returnees, it is practically equivalent to crop failure."*[41]

Though it had been established that food insecurity was a major threat to the populations of Sambo and Samboto, it was not possible to implement projects to the extent required, resulting in continued vulnerability and human suffering because anti-vehicle mine contamination had prevented access by humanitarian organisations. Between the assessment of 2002 and the heavy rains of 2003–2004, humanitarian organisations failed to address the structural vulnerability of Sambo and Samboto communes to food insecurity. As a result, those areas were particularly vulnerable to the impact of unfavourable conditions on their weak agricultural base.

Water, sanitation and health

Water and sanitation are primary humanitarian needs. They are essential for basic health, and vital precursors to other forms of humanitarian assistance. An influx of people to an area, as seen in Sambo and Samboto communes, can create severe health problems if necessary materials and skills are not in place to protect the population.

Open sources of water, such as springs and small reservoirs, are usable as long as the population density remains low. Defecation, animals dying and rain run-off through refuse in proximity to water sources cause contamination. Unless effective measures are taken, an increase in population will lead to an increase in the amount of bacteria per litre in the water, to a point at which the source becomes contaminated. Without a clean water source, a health post cannot be established. Some 80 per cent of diseases are related to water. Among the most common medical conditions suffered in Sambo and Samboto, malaria, diarrhoea and intestinal parasites are all related to the contamination or management of water. Unless medical staff can wash their hands and ensure hygiene (which requires clean water), they will spread disease, and the overall output of their intervention will be negative. Unless water and sanitation needs are met, mortality and morbidity among the population will remain high despite other forms of intervention.

With the rapidly rising population in Sambo and Samboto in 2002, Oxfam GB made plans to implement urgent water and sanitation programmes. Their teams drill wells to establish water sources and then work with the local community to establish understanding of how to avoid contaminating the source and how to control other water-related vectors — such as malaria, the biggest killer in this part of the country. They look at how to store water, how to dispose of rubbish, and where to situate latrines so as to avoid contamination. Like Save the Children Fund, Oxfam was forced to abandon its planned projects in this area when the threat of anti-vehicle mine contamination made access too dangerous.

Since assessments were undertaken in 2002, little progress has been made towards establishing an effective health infrastructure in Sambo and Samboto. Between the two communes, local government plans suggest that six health centres would be appropriate to serve the local population. There is currently one health centre (which only started running in December 2003), and this needs to be renovated if it is to provide an effective service. The lower tier of health provision should consist of 19 health posts. There are currently two fully operational health posts, and four others in need of rehabilitation. Vaccination programmes (for polio and measles) have also been constrained by anti-vehicle mines restricting access and by the condition of bridges in some areas.[42]

Figure 14. An Oxfam water and sanitation team drilling a well to provide safe water in Angola. Such projects have had to be abandoned where anti-vehicle mines mean that the teams and their equipment cannot reach the target populations. © Oxfam GB.

Most of the population still draws its water from rivers or springs (unprotected water sources). There is now one protected spring in Samboto town, and three others in need of rehabilitation. There is another pump in Chilala village, and Oxfam still has plans to construct an additional protected water source in this area. In Sambo, there is a pump at the health post. In all of the areas away from these few water sources, people lack the skills to manage sewage and to protect the natural water sources. The local government directly links the shortage of protected water sources to the ongoing high rate of deaths among children under five.[43] Although interventions to address these problems have been planned since 2002, anti-vehicle mine contamination has delayed the implementation of such projects, resulting in illness and death among the local population.

Increased cost of humanitarian assistance

While anti-vehicle mines may render vulnerable populations inaccessible to vital humanitarian assistance, this contamination can also have an overarching impact on the cost and quality of aid provision. In 2002, the World Food Programme stated that "*due to the insecurity and inaccessibility of critical areas with presence of landmines, WFP operates a passenger air service for certain humanitarian agencies*". The project's financial requirement for 2002 was US$4.8 million. The extension of the air service to move non-food items was projected as costing a further US$3.4 million.[44]

Transport costs

Lack of road access can cause a substantial increase in the cost of delivering humanitarian assistance. The need to rely on air transport in order to avoid contaminated roads inevitably increases the cost of moving goods and people into an area of operations. Isolation also has an impact on local market forces. Where goods are scarce and cannot be brought in a timely manner, any locally available sources are able to demand very high prices. Cement, a requirement in building protected water sources, may cost around US$7 per sack at the factory, but will trade for around US$30–35 per sack in areas where goods can only be delivered by air.[45] Other organisations have noted that the cost of plywood at US$9 per unit in Zambia increased to US$20 per unit in Luanda, and is then subject to further inflation after it has been flown into project areas.[46]

Owing to the general weakness of the road infrastructure, significantly compounded by the threat of anti-vehicle mines, some organisations with substantial logistical requirements have to operate aircraft themselves to ensure movement and supplies. This, combined with inflation in other areas as a result of access difficulties, can add millions of dollars to the costs of a single large humanitarian operation.[47]

Such increased costs mean that the cost per beneficiary of any operation increases. Thus, in addition to the denial of access to the most vulnerable populations in the country, fewer people receive humanitarian assistance out of the money provided than would have been the case if anti-vehicle mine contamination were not present.

Some 3,800,000 people were estimated to have been displaced by the end of the conflict in Angola. Anti-vehicle mine contamination has blocked routes planned for the repatriation of refugees. UNMAS has highlighted the fact that refugees returning spontaneously suffered anti-vehicle mine accidents, and that the Office of the United Nations High Commissioner for Refugees (UNHCR) was "*forced to delay organised repatriation because roads could not be used before they were cleared*."[48] Such delays in repatriation impede social normalisation in the wake of conflict. They also prolong the period over which refugees are receiving support. As a result of anti-vehicle mine contamination making roads unsafe for use, in addition to poor infrastructure, organised repatriation of many refugees has been undertaken by air.

Loss of equipment

Other problems occur due to changes in the assessment of roads as a result of incidents. When the *União Nacional para a Independência Total de Angola* (UNITA) reported after the peace agreement that it had placed anti-vehicle mines on roads in an area of Melange Province where Oxfam was already working, the project had to be shut down, and staff were withdrawn in a protected vehicle by a demining agency.[49] Drilling rigs, compressors, vehicles and other tools used for establishing basic levels of water and sanitation provision had to be abandoned, because they could not be transported back safely. Such equipment is expensive: a drilling rig costs approximately US$100,000, and compressors and four-wheel-drive vehicles cost around US$25,000 each.

Impact on humanitarian teams

The closure of a road due to an anti-vehicle mine incident can leave staff stranded in an area that is now inaccessible. A staff team from WFP was left stranded in a village for approximately eight weeks when an anti-vehicle mine accident on the access road occurred after they had deployed to the village. In a less extreme case, Oxfam had a team stranded in a village in Huambo Province for 15 days when an anti-vehicle mine closed the road behind them. Organisations also reported that the disruption caused by anti-vehicle mine incidents changing patterns of access could also leave teams frustrated and demoralised, causing increased tension among staff and a decline in the quality of assistance that they ultimately provide.[50]

Conclusions from this section

Anti-vehicle mine contamination can create a major, macro-level, structural problem. It blocks critical humanitarian assistance and depletes the quality and quantity of the assistance that is provided. By contributing to structural vulnerability, MOTAPM contamination causes other humanitarian problems to persist or reoccur.

The problems described with respect to Sambo and Samboto are not isolated occurrences in Angola. They are exceptional primarily because they afford a window onto the population. In many other areas, access has yet to be established by humanitarian organisations. The problems illustrated here and the problems that persist in Huambo are occurring despite ongoing work by landmine clearance organisations that is directly targeted at establishing access and supporting the efforts of humanitarian organisations.

5. Conclusions

Anti-vehicle mines that contain no internal mechanisms to limit their active lives persist as threats to civilian populations in the post-conflict environment. Where accurate and complete information on the location of these hazards is not available, they pose a technical problem to which landmine clearance organisations have no reliable, rapidly applicable solutions. Failures in the recording and maintenance of accurate records of anti-vehicle mine use are inevitable in conflict environments and are exacerbated where conflicts are prolonged.

Within the range of technical responses available to landmine clearance organisations, metal detection remains the most reliable and readily applicable method for locating anti-vehicle mines accurately. Even where other processes are used to reduce the suspect area, metal detection is often drawn upon to reveal the precise locations of the mines. This process relies on there being sufficient metal content within the mines to make them detectable with the currently available equipment.

MOTAPM present serious problems for the landmine clearance sector, and no mechanisms exist that can rapidly and reliably remove this contamination. If sophisticated mines, such as those fitted with sensitive fuses, become commonly used on the battlefield, then demining operations will be made more complicated.

Given the landmine clearance sector's limited capacity to resolve the problems of MOTAPM contamination quickly and effectively, post-conflict societies can suffer severe humanitarian problems while this contamination persists. By denying access, MOTAPM contamination contributes to the "structural vulnerability" of the affected communities — those deep-rooted vulnerabilities that cause other problems to persist or reoccur.

Even the *perceived* threat of MOTAPM may be sufficient to block access, and the process of removing the threat can be time-consuming and expensive. By blocking access, MOTAPM can trap populations in an emergency, denying them the opportunity to progress towards development. Where MOTAPM prevent humanitarian organisations from reaching the intended beneficiaries directly, they can force organisations to distribute aid through third parties without mechanisms for ensuring that assistance reaches the people most in need and without systems for monitoring project impact. MOTAPM can also block the return of refugees and IDPs to their places of origin.

MOTAPM raise the cost of implementing humanitarian projects. Where access is not blocked absolutely, it may be possible to deliver aid by longer routes or by air. However, the increase in logistics costs increases the cost per beneficiary of aid. As a result, fewer people receive assistance out of the funds provided than if anti-vehicle mines were not present. Furthermore, the presence of MOTAPM means that some communities are not even considered for humanitarian assistance, because their needs cannot be assessed.

Endnotes

1. Notably the ICRC's 2002 paper *Anti-vehicle mines: effects on humanitarian assistance and civilian populations* (CCW/GGE/II/WP.9).
2. In particular, UNMAS's paper (CCW/GGE/VII/WG.2/WP.3) on behalf of the Inter-Agency Coordination Group on Mine Action (IACG-MA). The IACG-MA is the coordination mechanism for all mine action policies and operations; it comprises 14 UN departments and agencies involved in mine action. UNMAS has also produced reports regarding its experiences of MOTAPM in Kosovo (CCW/GGE/II/WP.14), Afghanistan (CCW/GGE/IV/WG.2/WP.3) and Angola (CCW/GGE/VI/WG.2/WP.11), as well as an analysis of current and developing MOTAPM clearance technologies (CCW/GGE/VII/WG.2/WP.4).
3. The Convention on Prohibitions and Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects is often referred to as the Convention on Certain Conventional Weapons, or CCW. The CCW is an international instrument that regulates the use of weapons such as landmines, booby-traps and similar devices in conflict. It is distinct from the Anti-Personnel Mine Ban Treaty Convention, which deals with anti-personnel mines (CCW, 2004).
4. For the development of a new Protocol to provide further specific controls over the use of MOTAPM, it is first necessary for the Group of Governmental Experts to recommend, by consensus, that the States Parties to the CCW adopt a "negotiating mandate" with respect to this issue. Thus, the current process of discussions with regard to MOTAPM will determine whether or not a negotiating mandate can be established, and hence whether a subsequent specific Protocol will be drafted.
5. Within the CCW, a mine is defined as "*a munition placed under, on or near the ground or other surface area and designed to be exploded by the presence, proximity or contact of a person or vehicle*". An anti-personnel mine is defined as "*a mine primarily designed to be exploded by the presence, proximity or contact of a person and that will incapacitate, injure or kill one or more persons*" (Article 2 of Amended Protocol II to the CCW). From these definitions, it can be inferred that mines other than anti-personnel mines (MOTAPM) would refer to "*mines primarily designed to be exploded by ... vehicles*". As noted in the text, there is no formal definition of MOTAPM within the CCW. In a paper prepared for the July 2004 Group of Governmental Experts Meeting of the CCW (CCW/GGE/VIII/WG.2/WP.4), the GICHD noted that "*MOTAPM mine types include: anti-helicopter, anti-material fragmentation, anti-amphibious (these are shallow water mines, used on landing beaches and river crossings to target military vehicles such as armoured fighting vehicles), anti-tank blast, anti-tank shaped charge, anti-vehicle directional fragmentation, direction[al] fragmentation (often referred to by their generic name of 'Claymore' — these mines were included because they had sufficient power to endanger vehicles and fall under the definition of MOTAPM [even though they are anti-personnel mines when used in tripwire mode]), and off-route mines*". This wider formulation does suggest a need for clarification of the term MOTAPM. If adopted, this broader classification would raise additional issues regarding the application of proposals currently being considered by the CCW GGE.

6. The paper of the German delegation (CCW/GGE/VI/WG.2/WP.3) regarding sensitive fuses lists 11 different activation mechanisms for anti-vehicle mines.
7. GICHD, 2004: 100.
8. GICHD 2004.
9. GICHD, 2004: 88–89.
10. *Ibid*.
11. CCW/GGE/VI/WG.2/WP.5.
12. CCW/GGE/VII/WG.2/WP.4.
13. This estimate of time and costs was based on the US Army countermine programme's development of the Handheld Standoff Mine Detection System (HSTAMIDS), which required US$73 million over 15 years.
14. CCW/GGE/VI/WG.2/WP.11.
15. In particular, accidents involving Médecins sans Frontières (MSF) and ICRC vehicles in the latter part of 2002, and the discovery of anti-vehicle mines on well-used routes (such as between Huambo and Kuito), created an awareness of the extent and restrictive nature of MOTAPM contamination. During the war, there was an awareness of anti-vehicle mines presenting a problem in relation to mobility. However, the general restriction on movement caused by the ongoing conflict made the specific impact of anti-vehicle mines less obvious.
16. 2004 statistics from UNHCR Field Security incident lists. Data on such incidents is very weak in Angola, owing to difficulties related to access. As a result, a large number of incidents are believed to go unreported. Concerns have been raised by delegations to the CCW that accidents are attributed to MOTAPM that actually result from improvised explosive devices (IEDs) (CCW/GGE/VI/WG.2/WP.6). It is certainly true that IEDs are used to target vehicles, and that these devices do pose a humanitarian threat in a number of environments. In Angola, IEDs are also present and may include anti-vehicle mines attached to alternative initiating devices. However, the problems described in this report have been confirmed by qualified military and former military personnel as resulting primarily from anti-vehicle mines.
17. From a HALO Trust route assessment, 4 December 2003.
18. CCW/GGE/VI/WG.2/WP.11.
19. It has been reported that UNITA buried mines quite deeply, with sticks placed vertically above them to transfer pressure down from the road. Over time, the sticks would have deteriorated, leaving the mines deeply buried.
20. CCW/GGE/VI/WG.2/WP.11.
21. An additional complication to this issue comes in the form of "contracted transport". Some humanitarian organisations will not contract third parties (for example, for the haulage of supplies) to use roads that their own staff cannot use under their security guidelines. Other organisations will contract third parties and allow them to evaluate the risks for themselves.
22. Although a threat may be indicated on a road that has been previously assessed as low risk, this does not necessarily mean that the assessment was wrong or that additional clearance work is needed; an example might be if a mine is found or an accident occurs, but subsequent investigation finds that the mine was off the road surface and the original assessment had stated that the road verges were suspect and should not be encroached upon.
23. Interview with Miguel Techera, UNHCR Field Security Officer, Angola, 9 September 2004.
24. CCW/GGE/VI/WG.2/WP.8; CCW/GGE/VI/WG.2/WP.10.
25. Where agencies do establish either higher or lower thresholds for risk, they generally still take advice directly from humanitarian landmine clearance organisations as a basis for their judgements. Medair, for example, works on the basis of advice from the Mines Advisory Group (MAG) in Moxico, without waiting for this advice to be processed by the UNSECOORD system. The ICRC maintains its own database of incidents relating to road security and, with respect to anti-tank mines, relies primarily on advice from landmine clearance organisations. However, it takes a more cautious view of road security overall and does not accept UNSECOORD assessments *unless* these have been founded on advice from landmine clearance organisations.
26. Interview with Fernando Tabarez, UNSECOORD Luanda, 7 September 2004.
27. Interview with CARE Programme Manager, Angola, 8 September 2004.
28. CARE 2004: 7.
29. The quotation is taken from a WFP internal project concept paper regarding food security and access.
30. Interview with ECHO Angola, 7 September 2004. ECHO noted that its decision to start funding some landmine clearance and related work was due to the access problems faced by its other implementing partners.

31. Oxfam GB, among other agencies, noted that an assessment mission is necessary in order for any subsequent work to take place in an area.
32. This quotation is taken from a European Commission Europe Aid technical financing document for official use only.
33. Population figures based on local administration population data from March 2003. Access based on HALO Trust maps of passable routes, September 2004. Given the improvements in access between these two dates due to threat-reduction work on the routes, a greater proportion of the March 2003 population would have suffered from this lack of access.
34. Survey Action Centre (SAC) presentation to the National Inter-Sectoral Commission for Demining and Humanitarian Assistance (CNIDAH), 10 September 2004.
35. Governo Provincia Do Huambo, 2004: 7.
36. Save the Children UK, 2002.
37. Maize and beans are typically planted at the beginning of the wet season, with a further crop of beans and sweet potatoes at the end of the wet season. In low-lying areas with natural irrigation, additional crops can be planted in May or June and can be harvested in the first half of the wet season.
38. Discussion with Save the Children Fund project manager for Huambo, 14 September 2004.
39. This was highlighted by the Programme Manager of Medair, which is supporting refugee return in Moxico Province.
40. Governo Provincia Do Huambo, 2004: 9.
41. UNOCHA, 2004.
42. Governo Provincia Do Huambo, 2004.
43. Governo Provincia Do Huambo, 2004: 17.
44. WFP, 2002: 292.
45. Discussion with Oxfam GB Senior Programme Officer, Angola, 6 September 2004.
46. Discussion with Programme Manager, Medair Angola, 10 September 2004.
47. Discussion with ICRC logistics staff, Luanda, 7 September 2004.
48. CCW/GGE/VI/WG.2/WP.11.
49. It is important to note in such circumstances that a protected vehicle is not a solution to this problem but a way of mitigating the overall risk in an emergency situation.
50. Such impacts on team morale were reported by Oxfam and Save the Children Fund, particularly in relation to situations where access patterns changed and staff were left waiting to find out whether or not a project would be undertaken.

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Abbreviations and acronyms

ATB	anti-tank blast
ATSC	anti-tank shaped charge
CCW	Convention on Certain Conventional Weapons (1980)
ECHO	European Community Humanitarian Office
ERW	explosive remnants of war
GGE	Group of Governmental Experts
GICHD	Geneva International Centre for Humanitarian Demining
HALO Trust	Hazardous Areas Life-Support Organization
HEAT	high-explosive anti-tank (round)
ICRC	International Committee of the Red Cross
IDP	internally displaced person
IED	improvised explosive device
MAG	Mines Advisory Group
MEDDS	Mechem Explosive and Drug Detection System
MOTAPM	mines other than anti-personnel mines
MSF	Médecins sans Frontières
NGO	non-governmental organisation
REST	Remote Explosive Scent Tracing
UN	United Nations
UNDP	United Nations Development Programme
UNHCR	Office of the United Nations High Commissioner for Refugees
UNITA	*União Nacional para a Independência Total de Angola*
UNMAS	United Nations Mine Action Service
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNSECOORD	United Nations Security Coordinator
WFP	World Food Programme
WHO	World Health Organization

Annex 1.

Anti-vehicle mines found in Angola

Country of manufacture	Designation	Type	Metal content	Manufacturing State party to CCW Amended Protocol II
Belgium	PRB M3/A1	ATB	Low metal content	Ratified
China	Type 72	ATB	Low metal content	Ratified
Cuba	Designation not known (AT-8)	ATB		Has not ratified
Former Czechoslovakia	PP-Mi-Ba-II PP-Mi-Ba-III PT-Mi-D	ATB ATB ATB	Low metal content Low metal content	Czech Republic and Slovakia have ratified
Egypt	FBM	ATB		Has not ratified
Pakistan	P3 Mk2	ATB	Low metal content	Ratified
Romania	MAT-76	ATB	Low metal content	Ratified
Former USSR	TM-46/ TMN-46 TM-57 TM-62 B TM – 62M TMD-44 TMD-B TMK-2	ATB ATB ATB ATB ATB ATB ATSC		Russian Federation has not ratified
South Africa	No. 8	ATB	Low metal content	Ratified
Spain	C-3-A/B	ATB	Low metal content	Ratified
United Kingdom	Mk. 5 Mk. 7	ATB ATB		Ratified
United States of America	M6A2 M7A2 M15 M19 M24	ATB ATB ATB ATB HEAT	 Low metal content 	Ratified
Former Yugoslavia	TMA-2 TMA-3 TMA-4 TMA-5	ATB ATB ATB ATB	Low metal content Low metal content Low metal content Low metal content	Serbia and Montenegro has not ratified

Types: ATB (anti-tank blast); HEAT (high explosive anti-tank); ATSC (anti-tank shaped charge).
Source: *Jane's Mines and Mine Clearance, 2002-2003.*

Annex 2.

Countries or regions affected by MOTAPM

Afghanistan
Angola
Azerbaijan
Bosnia and Herzegovina
Cambodia
Chad
Chechnya
Chile
China
Croatia
Cuba
Cyprus
Djibouti
Ecuador
Egypt
Eritrea
Ethiopia
Falkland Islands
India (not listed in Jane's*)*
Iran
Iraq
Israel
Jordan
South Korea
Kosovo
Kuwait
Lebanon
Liberia
Libya
Mozambique
Myanmar
Namibia
Nicaragua
Pakistan (not listed in Jane's*)*
Rwanda
Somalia
Sri Lanka
Sudan
Thailand
Tunisia
Viet Nam
Western Sahara
Yemen
Zambia

Source: *Jane's Mines and Mine Clearance, 2002–2003.*

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