

**Meeting of the High Contracting Parties to the  
Convention on Prohibitions or Restrictions on  
the Use of Certain Conventional Weapons Which  
May Be Deemed to Be Excessively Injurious  
or to Have Indiscriminate Effects**

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**Mines other than anti-personnel mines (MOTAPM)**

**Issue brief**

**Submitted by the Geneva International Centre for Humanitarian  
Demining**

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## **I. Introduction**

1. The international community has discussed the impact of mines other than antipersonnel mines (MOTAPM) for several years. The First Review Conference of the Convention on Certain Conventional Weapons (CCW) in 1996 resulted in the adoption of Amended Protocol II, which is less restrictive with regard to the use of MOTAPM than with regard to the use of anti-personnel mines (APMs). Since then, efforts have continued in exploring the need and options for further legal regulation.

2. In 2001, the Second Review Conference of the CCW established an open-ended Group of Governmental Experts (GGE) to address the issue of MOTAPM. Despite the discussions in this GGE from 2001 to 2006, lack of consensus among High Contracting Parties prevented the adoption of an additional, legally binding protocol at the Third Review Conference.<sup>1</sup> However, at that occasion, a number of States Parties committed themselves in a political declaration to take the necessary steps to adopt, as a matter of national policy, the practices contained in the draft Protocol on MOTAPM.<sup>2</sup>

3. During the Fourth Review Conference in December 2011, High Contracting Parties to the CCW decided to convene an open-ended Meeting of Experts in 2012 “to discuss further the implementation of international humanitarian law with regard to mines other than anti-personnel mines.”<sup>3</sup>

4. There is no agreed definition of MOTAPM in the context of the CCW. For the purpose of this issue brief, the term MOTAPM is restricted to and referred to as anti-vehicle mines (AVMs).<sup>4</sup> This paper provides an overview of the humanitarian impact linked to the use of AVMs and challenges related to the clearance of this category of weapon.<sup>5</sup>

## **II. The Humanitarian Impact of AVMs**

5. AVMs have, in common with APMs, a considerable humanitarian impact on civilians. The specific effects of AVMs are seen in both the casualty figures which directly result from AVM incidents and in their impact on development within affected areas. This includes the blocking of roads and general access to and from mined areas. The free movement of people and goods on recognised routes is severely affected by the presence of AVMs.

### **A. Civilian casualties**

6. While delegates met at the 11th Meeting of the States Parties to the Anti-Personnel Mine Ban Convention (APMBC) in Phnom Penh last December, an accident involving an AVM occurred in Pursat Province, injuring six people.<sup>6</sup> Similarly, in early February 2012 in Banteay Meanchey Province, two AVMs killed eight farmers and injured one seriously.<sup>7</sup> The Landmine Monitor, in statistics from accidents where the type of weapon is known, identified 375 casualties resulting from AVM accidents in 2010, compared to 1275 casualties resulting from APMs. It is also noted that in some countries, such as Cambodia, more casualties occurred from AVMs than from APMs.

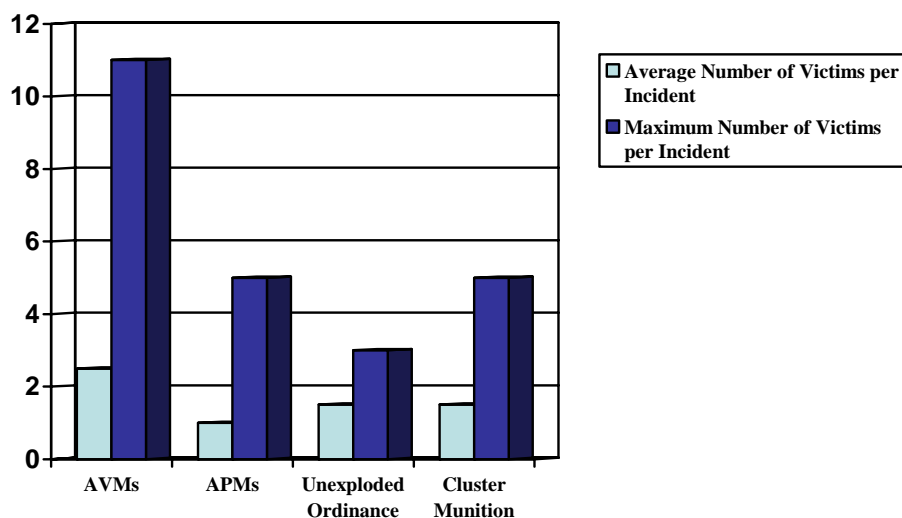
7. AVMs pose a distinct challenge in post-conflict contexts and civilians may also be increasingly likely to be harmed by AVMs as their societies develop. In Cambodia, for instance, a doubling of AVM casualties has negated the decrease in casualties from APMs.<sup>8</sup> There have been multiple incidents where tractors loaded with ten or more people hit relatively deeply buried AVMs in “cleared” or “safe” areas. Increased prosperity in North-

West Cambodia has led to a growing mechanisation of farming activities and to a higher number of tractors. These are detonating AVMs in places that had, for years, been safe for foot traffic or non-mechanised agricultural practices.<sup>9</sup>

8. AVMs also represent a considerable hazard to relief workers and peacekeepers on the ground. In its intervention during the CCW Group of Governmental Experts on MOTAPM in 2004, the United Nations Inter-Agency Coordination Group on Mine Action deplored accidents in several countries involving its own or other humanitarian personnel.<sup>10</sup> The International Committee of the Red Cross (ICRC) documented the death of 16 ICRC or National Society staff members and 63 injured during 1990-2000.<sup>11</sup>

9. Due to the forces acting on a vehicle, AVMs are likely to cause multiple deaths and injuries in one incident. Data extracted from the Reporting, Analysis, and Prevention of Incidents in Demining (RAPID) database<sup>12</sup> indicates a clear tendency of higher casualty ratio among demining personnel resulting from AVM accidents than from APM accidents. The average number of victims per AVM incident is more than twice the average number of victims per APM incident. The maximum number per incident has reached more than ten casualties in the case of AVM detonation.

**Figure 1: Number of victims per incident<sup>13</sup>**



10. Landmine Action also compared mortality rates resulting from incidents with AVMs to those with APMs. Data from Afghanistan and South Sudan (at that time the southern part of Sudan) serve as examples:<sup>14</sup>

| Mortality rates from |                               |                               |   |
|----------------------|-------------------------------|-------------------------------|---|
|                      | AVM incidents<br>(percentage) | APM incidents<br>(percentage) | AVM mortality<br>rates as per cent of<br>APM mortality<br>rates |
| <b>Afghanistan</b>   | 31                            | 18.7                          | +176  |
| <b>South Sudan</b>   | 47                            | 22                            | +214  |

11. Research has also shown that the longstanding perception that most AVMs are only activated by pressure above 150 kg, and therefore do not represent a hazard to civilian pedestrians, may not be true. Based on the biomechanical studies, researchers from the University of Loughborough in the United Kingdom demonstrated that human beings can exert an equivalent force to such pressures. For instance, an 8-year boy, weighing 30 kg and running downhill in his shoes, can produce a ground force of 146 kg, whereas a running adult male is capable of exerting 213 kg.<sup>15</sup>

12. There is a need for more systematic data collection about the impact of AVMs. However, the above figures point to a pattern of serious harm from the use of AVMs. This is characterised by:

- (a) high mortality and casualty rates per incident;
- (b) indiscriminate effects on civilians; and
- (c) particularly severe impact on people in developing post-conflict societies.

13. This hazard persists long after a conflict has ended, leading to indirect consequences specific to AVMs, which are considered below.

## **B. Restrictions of movement and access for emergency assistance**

14. When international humanitarian organisations are called upon to implement relief programmes in an effort to sustain life and provide a basis for local self-sufficiency, they envisage delivering assistance using the most rapid, efficient and effective line of communication - roads. AVMs are, however, particularly designed to be laid on roads. They frequently prevent access by humanitarian organisations to areas that require assistance or endanger the lives of humanitarian workers who deliver life-saving efforts. Another challenge relates to a sharp increase in the cost of essential projects designed to meet these vital needs.

### **1. Impediment to aid and humanitarian support**

15. In 2003, the European Community Humanitarian Office (ECHO) was one of the largest donors to humanitarian projects supporting the needs of vulnerable and remote rural populations in Angola. ECHO's priorities were water and sanitation, food security and primary health. The projects ECHO funded were greatly affected by changing patterns of access due to AVM contamination. This made it impossible to reach certain populations in need. ECHO explained that some 90 per cent of its projects in 2003 were affected by these difficulties.<sup>16</sup> The extent of this problem led ECHO to fund demining activities with a particular focus on securing access.

16. Almost all humanitarian interventions must be preceded by an assessment mission to establish the planning and funding basis for the project. If an area is not accessible, because the access roads have not been declared passable, populations in that area often are not even considered for assistance. AVM contamination prevents access to affected communities, putting populations beyond the reach, and sometimes out of sight, of humanitarian interventions. Almost two years after the conflict ended in Angola for instance, the Humanitarian Aid Committee stated that the critical needs of approximately 100,000 people still remained unconfirmed due to a lack of access.<sup>17</sup>

17. In its 2002 paper submitted to the Group of Governmental Experts, the ICRC argued that the confirmed existence or even the fear of the presence of AVMs may lead to closing routes for months or years, obstructing "the movement of goods, essential relief supplies and people in huge areas. In one reported incident in Mozambique, two villages were isolated from the rest of the province for more than ten years due to the presence of one

single AV mine.”<sup>18</sup> These issues result in a continuation of “emergency” conditions at a time when assistance should be moving towards development efforts.

## **2. Impact on cost and quality of delivery**

18. While AVMs may render vulnerable populations inaccessible for the delivery of vital humanitarian assistance, this contamination may also have a broader impact on the cost and quality of aid provision. In 2002, the World Food Programme (WFP) 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.”<sup>19</sup> In 2004, WFP’s delivery of food aid to Sudan was 40-45 million United States dollars with 65 per cent of this being air transport costs. Previous investments in road repair had been limited to 8 million United States dollars from 1998 – 2003 to open up corridors over 1500 kilometres in length. This was less than 3 per cent of the transport costs over the same period. The agency quickly realised that road repairs and minor fixes along key corridors would allow for ground transport for much of the shipping.<sup>20</sup> As a consequence, whereas WFP worked with transport rates of more than 850 United States dollars per metric ton in Sudan in 2003 when these included airdrops, food could be delivered at less than half this cost in 2010 owing to increased availability of road transport. The shift away from air shipping also allowed considerably increased and faster food delivery.<sup>21</sup> The ICRC also pointed out that relief operations’ transportation costs may increase by ten to twenty times when goods have to be delivered by air instead of by road.<sup>22</sup>

## **C. Impact on poverty reduction, longer-term development and return/resettlement**

19. In addition to directly harming civilians and hampering emergency assistance operations, AVMs have a considerable impact on the longer-term development prospects of affected communities. They also directly endanger returning refugees and internally displaced persons (IDPs).

### **1. AVMs and structural vulnerability**

20. WFP’s vulnerability analysis system considers two key categories:

(a) 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.

(b) 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.

21. Within such a framework, structural vulnerability is the basis for persistent economic weakness. 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”.<sup>23</sup> That is to say, access is fundamental to alleviating extreme and structurally rooted poverty.

22. AVM contamination may prevent the use of agricultural or pasture land in rural areas. It impedes reconstruction of vital infrastructure such as bridges, irrigation systems or schools<sup>24</sup> and has an impact on the local economy and prices.

## **2. Impact on IDPs and refugees**

23. Presence of AVMs prevents safe and prompt return and resettlement of refugees and IDPs. Delays in repatriation impede social normalisation in the wake of conflict and prolong the period over which refugees require support. In Angola, for instance, approximately 3,800,000 people were estimated to have been displaced by the end of the conflict. Repatriation of these refugees was slowed down by AVM contamination. The United Nations Mine Action Service (UNMAS) has highlighted the fact that refugees returning spontaneously suffered AVM accidents, and that the Office of the United Nations High Commissioner for Refugees (UNHCR) was “forced to delay organised repatriation of refugees because roads could not be used before they were cleared.”<sup>25</sup> As a result of AVM contamination making roads unsafe for use, organised repatriation of many refugees was undertaken by air, which significantly increased the costs of resettlement.

24. In other cases, if areas cannot be accessed due to AVM contamination, IDPs or returning refugees may be constrained to resettle in other areas. This can then lead to problems related to land disputes, overcrowding or putting pressure on resources such as land for housing, water, agricultural and pasture land, or on basic services such as education and health.<sup>26</sup>

## **III. Clearance of AVMs on roads**

25. Roads are vital for emergency relief operations and longer-term development of affected communities, as described above. However, AVMs are mainly used and found on roads. Where AVM contamination is suspected and information on the precise location of the hazard is limited, mine clearance organisations are faced with a particularly complex problem. Slow and costly processes are likely to be needed if it is to be thoroughly addressed.

26. Characteristics of each road type have particular implications for the clearance requirement. For an asphalt or paved road, it is normally clear where the course of the road is, and where the features of the road are. For a dirt road, on the other hand, it is probably less clear where the traffic lanes and shoulders meet – and the physical course of the road might not be clear. Dirt roads can “move” during the rainy season. As a consequence of the road’s poor conditions, the driver may choose a route beside the regular cleared road, taking considerable risks. Accidents frequently occur following this pattern.<sup>27</sup> It may also be difficult for the clearance organisation to establish the path of the road during the time of the conflict when the mines were placed. To mitigate this hazard, a buffer needs to be cleared on each side of the road.

27. Survey and clearance of a road is different from survey and clearance of an area of land. The scale of the operation is a function of the length and width of the area potentially to be cleared, the type of ordnance typically encountered and its impact, and decisions on the depth of clearance needed. In terms of size, the areas of road suspected to be hazardous are potentially vast – amounting to thousands of kilometres in length and thousands of square kilometres, if the width is factored in. Another challenge is that roads are often overgrown with vegetation as they have not been used for long periods of time. This vegetation must be cut and removed.

28. Today there is a broad set of generic principles and requirements related to mine clearance. These are widely understood throughout the mine action sector. Their application to roads has yet to be fully explored in practice, but land release methodology offers useful insights on how to maximise efficiency in road clearance.<sup>28</sup>

## **A. Manual mine clearance methods**

29. A prime challenge, specific to the manual clearance of AVMs, lies in the limited workspace available to the deminers. While the overall Suspected Hazardous Area may be large, the area that can be accessed by each deminer is narrow. This reduces the number of deminers who can work on the task - at least initially until necessary safety distances can be achieved. Manual demining of roads has proven to be slow and expensive. Given the typical length of roads to be surveyed and cleared – many kilometres – manual demining, using traditional detectors, should be focused on confirmed or localised high-risk areas.<sup>29</sup>

30. If the operator can positively verify that an area contains only high metal content AVMs, it is possible to increase the speed of operation. This is by using less sensitive detector technology, such as wide area detectors, or by reducing the detector sensitivity in order to minimise the level of false alarms resulting from contamination by other metal objects. If, however, a clearance operator is facing minimum metal AVMs, the speed of clearance will be greatly reduced and the depth of clearance will be dependent on both the type of AVM and the type of soil the road is constructed from. Anti-handling devices (not commonly found), which are activated when a mine is disturbed, will present an additional risk to deminers and thus slow down clearance further. Speed will also be affected by the type of soil encountered, hard and sun baked soils, metal contamination and vegetation that has to be carefully cut and removed.

## **B. Mechanical demining assets**

31. The use of mechanical demining assets can significantly increase the rate of technical survey and clearance, including road clearance. Most demining machines are, however, not designed to sustain several AVM detonations. Even if there is no critical damage to the machine, required repairs are sometimes expensive and time-consuming – particularly when operating in remote locations – creating “down-time”, greatly increasing the costs of such operations.

32. When using mechanical demining assets on roads, repair work will be required after the mechanical intervention since the machine will destroy the surface of the road.

33. Systems have been developed that, owing to their size, mass (approximately 40–60 tons) and protection, are capable of withstanding multiple AVM detonations without major damage. In practice, however, some of these systems are hard to use in humanitarian demining, in the operating environments encountered, because of their price, high running costs, requirement for maintenance and the inadequate local infrastructure for transportation of large machines.

34. Locally manufactured machines are also used for clearance. Examples of such machines are excavators and front end loaders that have been armoured and fitted with a sifting system that will sift through soil and leave AVMs and other explosive ordnances in the sifting device.

35. Mine Protected Vehicles are vehicles that have been armoured and designed to sustain an AVM blast. Typically such machines are fitted with some detection systems, such as a larger metal detector or other ground penetrating radar.

## **C. Animal detection**

36. Animal Detection Systems (ADS) are based on the ability of certain animals to detect the vapour from landmines and other explosives. It is commonly used within

technical survey, clearance and quality control field operations. Currently the animals categorised under the term ADS are dogs and rats, with dogs representing the majority use and rats a specialised niche.

37. The main advantages connected to the use of animal detection are cost-efficiency and the fact that depth factors are largely irrelevant to the animal, as long as the explosive molecules have reached the surface where they will be detected. The main disadvantages are that animals cannot be used in areas with heavy vegetation and are easily affected by weather conditions such as wind and rain.

38. Animals have also been used in a Remote Explosive Scent Tracing (REST) capacity where ground or dust samples are collected on roads (or other Suspected Hazardous Areas) and forwarded to laboratory facilities where dogs/rats are used to analyse the samples and indicate when there is a presence of explosives. The REST approach, when used with other survey techniques, can play an important role in targeting clearance efforts and speeding up the opening of roads.

## **IV. Conclusion**

39. AVMs persist as hazards to civilian populations in a post-conflict environment. The average number of victims per AVM incident is indeed more than twice the average number of victims per APM incident. Where accurate and complete information on the location of these hazards is not available, they pose a challenge to which landmine clearance organisations have no reliable, rapidly-applicable solutions. Failures in the collection and maintenance of accurate records of AVM use are common during conflicts and are exacerbated when hostilities are prolonged.

40. Post-conflict societies can suffer severe humanitarian problems and development constraints for prolonged periods due to AVM contamination. By denying access, AVMs contribute to the “structural vulnerability” of the affected communities.

41. Even the perceived threat of AVMs may be sufficient to block access, and the process of removing the hazard is generally time-consuming and expensive. By blocking access, AVMs can trap populations in destitution, denying them the opportunity to develop. AVMs can also block the return of refugees and IDPs to their places of origin. AVMs raise the cost of implementing humanitarian projects. Where access is not blocked completely, it may be possible to deliver aid by longer routes or by air, but at a much greater cost. Fewer people receive assistance from the funds available than if AVMs were not present. Presence of AVMs means that some communities are not even considered for humanitarian assistance because their needs cannot be assessed.

42. Among the measures that should be taken to effectively reduce and prevent the humanitarian impact of AVMs, enhance the work of post-conflict mine clearance operations and accelerate development and reconstruction, is the strengthening of the legal framework governing the use of AVMs.

### *Notes*

<sup>1</sup> Report of the Work in 2006 on mines other than anti-personnel mines, annex II, 13 October 2006 (CCW/CONF.III/7/Add.2).

<sup>2</sup> CCW/CONF.III/WP.16.

<sup>3</sup> Final document of the Fourth Review Conference, 15 December 2011 (CCW/CONF.IV/4/Add.1).



- <sup>4</sup> AVM is the civilian term of the military “anti-tank mine”. 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.”
- <sup>5</sup> This Brief is based on the study “Humanitarian impact from mines other than anti-personnel mines” published by the GICHD in October 2004 and updated with more recent evidence and data.
- <sup>6</sup> Handicap International Switzerland, “Bilan de la conférence sur les mines antipersonnel au Cambodge – De nouvelles victimes rappellent aux États qu’ils doivent renforcer leurs engagements contre les mines”, 2 December 2011.
- <sup>7</sup> The Phnom Penh Post, “Anti-tank mine blast kills eight, injures one”, 6 February 2012.
- <sup>8</sup> Landmine Monitor 2011, pg. 31 and 36.
- <sup>9</sup> CMVIS; Handicap International Belgium; Norwegian People’s Aid and UNICEF, A study on the dramatic decrease of mine/UXO casualties in 2006 in Cambodia, October-December 2006, pg. 8.
- <sup>10</sup> A Common Inter-Agency Coordination Group on Mine Action (IACG-MA) Position on mines other than anti-personnel mines (MOTAPM), 10 March 2004 (CCW/GGE/VII/WG.2/WP.3).
- <sup>11</sup> ICRC, Anti-vehicle mines: effects on humanitarian assistance and civilian populations, 15 July 2002, page 4 (CCW/GGE/II/WP.9).
- <sup>12</sup> The reporting, analysis, and prevention of incidents in demining (RAPID) is an electronic database of accidents and incidents involving field employees at a demining workplace. It is based on the information management system for mine action next generation (IMSMA NG). RAPID collects information and enables the analysis of trends in demining accidents on a global level. Its main purpose is to lead to work practice changes and the development of safer tools and protective equipment in order to prevent future accidents. The GICHD has developed and maintains RAPID at the request of UNMAS.
- <sup>13</sup> This data from the RAPID database takes into account 527 accidents from 20 countries during 1991-2011.
- <sup>14</sup> Landmine Action, Anti-vehicle mines: Understanding the impact and managing the risk, London, 2006, pg. 14.
- <sup>15</sup> Actiongroup Landmine.de; The Uniting Church in Australia justice and international mission unit, Synod of Victoria and Tasmania; MAG, Anti-vehicle mines discussion paper, November-December 2004, page 5.
- <sup>16</sup> Interview with ECHO Angola, 7 September 2004.
- <sup>17</sup> Landmine Action, Anti-vehicle mines: Understanding the impact and managing the risk, London, 2006, page 23.
- <sup>18</sup> ICRC, Anti-vehicle mines: effects on humanitarian assistance and civilian populations, 15 July 2002, page 2 (CCW/GGE/II/WP.9).
- <sup>19</sup> WFP, Projected 2002 needs for WFP projects and operations, Rome, 2002, page 292.
- <sup>20</sup> Information provided by WFP, South Sudan, on 19 March 2012.
- <sup>21</sup> Benjamin Wang, Roads impact assessment, Cornell University, (2011), provided by UNMACC, South Sudan, on 24 February 2012.
- <sup>22</sup> ICRC, Anti-vehicle mines: effects on humanitarian assistance and civilian populations, 15 July 2002, page 3 (CCW/GGE/II/WP.9).
- <sup>23</sup> The quotation is taken from a WFP internal project concept paper regarding food security and access.
- <sup>24</sup> Field Report Afghanistan, by a former technical advisor of the mine action programme in Afghanistan for the United Nations Mine Action Service, 14 March 2003 (CCW/GGE/IV/WG.2/WP.3).
- <sup>25</sup> Field report on Angola, presentation prepared by the United Nations Mine Action Service, 21 November 2003 (CCW/GGE/VI/WG.2/WP.11).
- <sup>26</sup> Landmine Action, Anti-vehicle mines: Understanding the impact and managing the risk, London, 2006, pg. 27.
- <sup>27</sup> See for example: Field report Afghanistan, by a former technical advisor of the mine action programme in Afghanistan for the United Nations Mine Action Service, 14 March 2003 (CCW/GGE/IV/WG.2/WP.3).
- <sup>28</sup> GICHD, A Guide to road clearance, Geneva, 2008, page 62.
- <sup>29</sup> GICHD, A Guide to road clearance, Geneva, 2008, page 50.