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**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)**

**Understanding detectability**

**Submitted by Australia**

**I. Purpose**

1. The purpose of this non-paper is to highlight the key issues related to MOTAPM detectability and how these contribute to causing unacceptable humanitarian harm in some circumstances.

**II. Why and how are MOTAPM used?**

2. Before addressing the subject of detectability it is necessary to briefly describe how and why MOTAPMs are used. Within professional military forces MOTAPM are primarily a defensive weapon used to delay and disrupt enemy movement, and to channel them into selected areas where they can be engaged by other weapon systems. They are often used as permanent defences between States with contested borders or which may have unresolved tensions. These protective minefields are often pre-planned and laid ahead of active hostilities. In these circumstances the minefields are usually marked to define the minefield perimeter and to prevent the inadvertent entry into the minefield by innocent parties. In more mobile and fast moving operations MOTAPM may be laid more hastily and the extent of the minefield may not be marked. For most professional armies there is a requirement nonetheless to record, in all circumstances, the details of a minefield in terms of the type, quantity and location of the mines laid as well as the extent of a minefield's perimeter, regardless of whether it is physically marked or not (as per Article 9 and Technical Annex of CCW Amended Protocol II). These procedures are not generally adhered to by non-state actors who for their own purposes may use MOTAPM.

3. Occasionally, MOTAPM will be used to achieve a nuisance effect, to delay and slow enemy movement and to leverage off the significant psychological effect that these weapons create when they cause unexpected death and injury. This is very similar to the effect currently being caused by the significant improvised explosive device (IED) problem now being faced in places such as Afghanistan. In these circumstances, MOTAPM are laid

in very small numbers, often just singly, and not according to the predictive pattern normally associated with a protective minefield.

4. The tactical advantage afforded by a minefield is enhanced by making the MOTAPM within them difficult to locate and clear. This is more often done by burying the mines themselves but as technology has developed this has been enhanced by reducing the metal content within the mines, thereby reducing the effectiveness of the most common mine detectors which rely on metal detection.

### **III. What is detectability?**

5. Detectability refers to the ease with which a MOTAPM can be located by commonly available technical mine detection equipment once it has been emplaced for an intended purpose. Minimum guidelines for detectability of anti-personnel mines were established during the negotiation of Amended Protocol II (APII). However, detectability is impacted upon by a variety of factors and there are significant differences between those which are most important under operational conditions and those which are most relevant in humanitarian circumstances.

### **IV. Amended Protocol II (AP II)**

6. Earlier consideration of MOTAPM in the CCW involved discussion on what constitutes the minimum metal content that assures detectability for humanitarian purposes. The Technical Annex of APII provided a very useful starting point. It notes:

“(a) With respect to anti-personnel mines produced after 1 January 1997 such mines shall incorporate in their construction a material or device that enables the mine to be detected by commonly-available technical mine detection equipment and provides a response signal equivalent to a signal from 8 grammes or more of iron in a single coherent mass.

(b) With respect to anti-personnel mines produced before 1 January 1997, such mines shall either incorporate in their construction, or have attached prior to their emplacement, in a manner not easily removable, a material or device that enables the mine to be detected by commonly-available technical mine detection equipment and provides a response signal equivalent to a signal from 8 grammes or more of iron in a single coherent mass.”

7. While these provisions of APII apply to anti-personnel mines, the issue of non detectability by virtue of minimal metal content is the same for MOTAPM and the above guidance continues to provide an accepted standard from which to base further discussions.

8. Earlier CCW discussions on MOTAPM considered what constitutes “commonly-available technical mine detection equipment”. While the most commonly available technical mine detection equipment continues to be the standard electromagnetic-induction based mine detector, technology does continue to develop and there is a growing range of technologies available. This said most are very expensive, have a high training requirement, and are often unaffordable for humanitarian demining operations.

9. Arguably, notwithstanding the growth in the technologies available the “8 grammes” standard should continue to provide the benchmark for further discussion.

## V. Operational detectability

10. The imperative that drives mine detection during operations is the need to determine the location and extent of a minefield as well as ascertaining the type of mines contained therein and the density in which they are laid. Once these are determined a time and risk calculus is balanced against potential operational gain to determine whether lanes should be cleared through the minefield or whether an alternate route that bypasses the minefield should be found.

11. Mine clearance under operational circumstances is usually done in a time constrained, high threat environment. As such, those laying the minefields can leverage their local battlefield conditions, the physical characteristics of the mine and the local environmental elements of the battlefield to reduce the detectability of the MOTAPM being used. For example, mines laid on the surface of the ground in long grass may be difficult to detect by personnel moving in armoured vehicles at speed in the night and under threat from other weapon systems. In contrast in open bare ground under the same circumstances, it may be necessary to bury the mines to ensure they are less detectable and the desired effect is still achieved. In addition to these factors, detectability is impacted upon by the physical characteristics of manufacture (size, shape, colour, and the materials which are used in its manufacture, notably its metal content) as well as environmental elements such as the soil conditions (the soil type and its moisture content) as these impact upon the efficiency and effectiveness of the detection systems used.

12. Furthermore, the operational effectiveness of a minefield is driven by a range of factors that extend well beyond the detectability of the MOTAPM itself. Most important amongst these is the positioning of the minefield so that it maximises the effects of the local terrain (such as rivers, mountains and obstacles like buildings) and its integration with other weapons systems (such as artillery, tank, fighter aircraft and attack helicopters). Arguably though, the proliferation of battlefield surveillance systems and the fast moving nature of modern warfare have reduced the battlefield value of non-detectability in the conventional setting in comparison to these other factors. The notable counterpoint to this observation is that when MOTAPM are used in isolated numbers, for example as part of an IED in a road, their non-detectability continues to deliver a notable military effect by virtue of the delay and psychological effect they cause. For this reason some may continue to argue that non-detectability continues to afford a military advantage, albeit an arguably small one.

## VI. Humanitarian detectability

13. The imperative for humanitarian minefield clearance is twofold: (1) To determine the extent of the minefield and the type of mines within it; and (2) To clear with a very high degree of certainty every mine in the minefield such that the potential for the death or injury post clearance is virtually eliminated.

14. Humanitarian mine clearance is typically done in a low/no threat environment and in situations where time can be taken to gain a solid understanding of the nature of the minefield. In these circumstances battlefield conditions are of no relevance. Rather, the design characteristics of the MOTAPM and the local environmental conditions are the key factors impacting upon detectability. Of these, the metal content of the mine currently remains the key determinant of the ease with which a mine can be detected by commonly available technical mine detection equipment. As a result, MOTAPM with low metal content in their construction pose a particularly difficult problem for humanitarian deminers as this makes them more difficult to detect, particularly the deeper they are buried. Also the metallic detritus of war, such as shrapnel and spent bullets, as well as scrap metal, means that every response to a metal detection initially needs to be treated as a mine. This

adds significantly to the time and costs associated with undertaking humanitarian mine clearance.

## **VII. Operational mine breaching versus humanitarian mine clearance**

15. Removing mines under operational conditions is quite different to clearing them for humanitarian purposes. One trades off the risk of casualties from mines with the benefits gained from a quick breach and timely engagement with an enemy to seize an objective. The other, conducted in the absence of a threat, is undertaken in a rightfully risk managed approach which is focused on ensuring the safety of deminers and on the lives of the civilians who will ultimately use cleared land.

## **VII. Operational mine breaching**

16. Minefield breaching occurs during battle and is undertaken to enable ones own forces a clear path through a minefield so that they may engage the enemy. It involves creating lanes through a mined area by the quickest means possible in order to provide the required mobility to the supported attacking force. Therefore, the cost of potentially missing a mine is traded off against prolonging exposure to enemy fire. The clearance is restricted to these narrow lanes only and the rest of the emplaced minefield is simply bypassed. Given the requirement for speed and protection from enemy fire, most military breaching equipment is tank mounted or involves explosive devices.

## **IX. Humanitarian mine clearance**

17. In contrast to mine breaching, International Mine Action Standards for mine clearance involves precisely locating and marking the mined area, and then carefully removing or destroying all mines and explosive remnants of war (ERW), including unexploded sub-munitions hazards from an area to a specified depth. Humanitarian demining is complicated by the fact that the world is not flat and mine clearance systems are usually designed for use in open, flat and sandy fields. However, mines are laid wherever soldiers can fight including on the sides of mountains, in rice paddies, in banana and tea plantations, jungles, bogs, aquaducts and rivers. As such, most humanitarian demining continues to utilise a combination of systems involving deminers with prodders and metal detectors, explosive detection dogs, and, where the conditions allow, purpose built mechanical mine clearance systems such as flails.

## **X. MOTAPM construction**

18. MOTAPM usually fall into two categories to achieve their intended effect. One relies entirely on its blast effect so that it uses bulk quantities of explosive to achieve the desired effect. While older systems were typically contained within a metal casing, modern variants can use a plastic casing and therefore can have a very low metal content. This can make them very difficult to detect. The second and more sophisticated type utilises a shaped charge effect in which a specially designed metal plate is exploded, in order to form a projectile and penetrate the hull of an armoured vehicle. These clearly have a higher metal content and are easier to detect using commonly available technical mine clearing equipment.

## **XI. Detection methods**

19. There has been significant investment in detection technologies arising from the counter-IED research since the CCW's last consideration of MOTAPM which are relevant to discussions on MOTAPM detectability. Notwithstanding these advancements there has not been a significant change in the most efficient and cost effective systems since the Second World War. These remain a combination of biosensors (explosive detection dogs) and soldiers/deminers with metallic mine detectors and mine prodders. Combined, these provide the best assurance that an area is clear of mines but even these are subject to environmental and physical conditions such as heat, dust, weather, and tiredness which can reduce their effectiveness over time.

20. There has been a significant expansion in the range of countermining technologies, including ground penetrating radar, vapour sensors, infra-red sensors, nuclear quadrupole resonance, biological sensors (animals, bacteria and plants), and hyperspectral imagery to name a few, as well as systems which fuse a number of these sensors into a single detection system. While there has been a growth in the use of these systems they have by no means received the level of universal adoption as has the standard electromagnetic induction metal detector. They also remain very expensive, mostly used by highly developed defence forces and are out of the financial and technical reach of most humanitarian demining operations.

## **XII. The humanitarian detectability challenge**

21. Arguably the most significant impediment to humanitarian demining arises from the need to deal with low metal content mines which are time consuming to locate, particularly, as noted earlier, in areas where their signal can be confused with that of scrap metal such as artillery shrapnel. This can result in many false positive findings, each of which must be treated as a mine until shown otherwise. This significantly adds to the clearance burden.

## **XIII. Resolving detectability**

22. The simple solution to addressing detectability is to ensure all MOTAPM have a minimum metal content along the lines established within APII for anti-personnel mines. This is easy to implement for all future systems but it does not address the many millions of mines that are currently in place or which are in the stockpiles of many nations where they are considered as essential weapon systems within national security contingency plans. The need for these systems will arguably decline as technological advances are made, and as the tactical doctrine used by States evolves, but these will take time and are dependent upon the needs and circumstance of each State.

23. Some CCW High Contracting Parties will continue to value the military utility of MOTAPM. Therefore, an approach which restricts use and is focused on minimising post conflict humanitarian harm will have the best chance of success.

24. It therefore seems that in its consideration the Meeting of Experts should, amongst a range of other important areas, consider how detectability standards could be applied in relation to future MOTAPM systems, existing minefields and existing stockpiles with a view to ensuring expeditious clearance post conflict.

25. As noted, future systems could be addressed simply by requiring a minimum metal content. The hazards associated with existing minefields can be reduced by ensuring they are appropriately marked and monitored to ensure the effective exclusion of civilians.

Once a minefield is no longer necessary it is prudent from a national and humanitarian perspective to clear it as soon as is practical and to keep it marked and monitored until such time as clearance can occur.

26. By far the hardest challenge for the CCW, should it decide to continue discussions on MOTAPM, is to determine an appropriate treatment of low metal content mines in stockpiles. Arguably the restriction of their use to marked minefields only may provide one solution. This could be supported by an approach which pursues their destruction and replacement if necessary by compliant systems once their life of type has expired. A further alternative would be to retrofit a small amount of metal to the exterior of the munition to achieve the minimum acceptable metal content. All of these were discussed in previous CCW consideration and will need to be reviewed again should further work on MOTAPM be agreed.

#### **XIV. Summary**

27. The purpose of this paper has been to articulate the key issues associated with discussions on detectability. Rather than propose a particular solution to this issue its aim has been to highlight the ground covered by previous CCW discussions and those areas that may need to be considered in the future.

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