

**GROUP OF GOVERNMENTAL EXPERTS OF
THE STATES 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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Working Group on Mines Other Than Anti-Personnel Mines

Detectability of Anti-Vehicle Mines

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INTRODUCTION

1. Military forces use Mines Other Than Anti Personnel Mines (MOTAPM) to block, fix, turn and disrupt an enemy. Protecting or delineating border areas may require persistent, fixed minefields whilst military campaigns may use both pattern minefields laid in relatively slow-time as well as rapidly emplaced, scatterable minefields laid in response to specific threats. MOTAPM may also be used by non-military organisations including terrorist groups to deter, demoralise or destabilise an area either in pursuit of their own goals or to prevent success by others.
2. Undetectable mines, except in narrowly defined, specific applications, have no overwhelming military advantage.
3. For the purposes of this paper mines are considered 'undetectable' if they contain less than the equivalent mass of 8 gm of iron, as already applies for anti-personnel mines under paragraph 2(a) of the Technical Annex to APII.

BORDER AND PROTECTIVE MINEFIELDS

4. Military forces may require persistent minefields to protect borders, fixed positions or establishments. In all cases it is likely that mines will be in place for months or years. Where practical, minefields will be fenced but in remote areas they may have minimal fencing or marking.
5. These mines will normally be buried to prevent them being easily seen and avoided. In some cases, minefields will be guarded and kept under observation by day and night and in these cases it is highly likely that intruders will be seen and stopped before they have penetrated the minefield. In other cases the mines may not be guarded at all times. The effectiveness of these minefields will be measured by the amount of delay they impose on an intruder.

MINEFIELDS USED WHILST WAR FIGHTING

6. Forces at war or engaged in Other Operations may have a requirement for both protective minefields, laid in relatively slow time to shape the battlefield or provide intimate protection for troops, and rapidly emplaced mines to counter a specific enemy threat. Mines may also be used to protect the flanks of troops on the move. Scatterable mines will be needed quickly but are likely only to be required in place for a relatively short time. Once their usefulness has been exceeded they become an obstacle to the free movement of all successive personnel and vehicles in that area - friend, foe or civilian alike. Pattern minefields, laid by hand or mechanically, may be required for longer but will also represent an obstacle to free movement once the battle has moved on. Pattern minefields, usually buried, are more effective if non-detectable in preventing a covert, normally silent, breach typically carried out at night. In all other cases there are no military advantages to them.

7. Mines laid to protect a flank or counter enemy activity may be laid remotely. Remotely delivered mines lie on the surface and there is no advantage gained by their being non-detectable. The probable future increase in the use of non-persistent mines (with self-destruct or self-neutralisation (SD/SN) will further reduce the military value to be gained from non-detectability.

BREACHING MINEFIELDS

8. Minefields can be breached by three main methods: manual means using metal detectors and prodding; mechanical means, such as mine ploughs or rollers; or explosive means. In the first case, research predicts that non-detectable mines take longer to clear. However, the circumstances when this will apply to war-fighting (eg covert breach at night) may be limited and in real terms restricted to a few operations by well-trained troops. Multi-sensor detectors (eg those incorporating both ground penetrating radar (GPR) and metal detection capabilities) may have some impact on this limited advantage when they become more widely available and technically effective. The detectability of mines will have very little impact on the success or speed of a major breaching operation. When mechanical or explosive means of breaching are employed, there is **no** military advantage to using non-detectable mines.

9. All properly laid and guarded minefields will have the effect of slowing down an enemy advance. Making the mines 'non-detectable' will add little and possibly nothing to the amount of time by which they are delayed. The use of 'non-detectable' mines confers little significant military advantage and the benefits of 'non-detectability' are often exaggerated. This applies to both mines laid in formal minefields and those laid as nuisance mines which, unless effectively guarded and protected, offer little delay to a determined and well-equipped force.

HUMANITARIAN REQUIREMENT

10. Mines without SD/SN can remain in the ground for a very long time. The key requirement to return land to pre-conflict use as quickly as possible can be significantly enhanced if all mines are detectable by cheap and readily available methods. Non-detectable mines delay the return to normality and can increase the time and cost required from post-conflict peacekeeping forces in terms of both casualties and fiscal support. The safety of those engaged in the delivery of humanitarian support or aid, therefore depends to a great extent on the detectability of mines. Even very few mines can have a disproportionate effect on the free movement of people and vehicles, or of the cultivation of an area. Despite roads and tracks being swept by increasingly sophisticated detectors, mines with even minimum detectability are more easily found and dealt with than non-detectable weapons. Non-detectable mines delay the return to normality and threaten the lives of those engaged in post-conflict reconstruction or aid.

11. Random-laid undetectable mines also threaten military forces operating in a post-conflict environment. The task of military forces engaged in Peace Keeping type operations may be made easier if mines are more easily detectable.

CURRENT DETECTORS AND THEIR LIMITATIONS

12. A number of technologies have been developed for detecting mines. The two that are either in service or close to being in service, are metal detectors and GPR. Both can be effective although cost and ease of use issues remain. Both have limitations:

- a. Certain soil types (high metal content soils) degrade metal detectors.
- b. Metal detectors are degraded by very wet conditions.
- c. GPR is degraded by some soil types and by wet conditions.
- d. Neither method - either individually or when used together in a multi-sensor system - can effectively detect mines from the air. Buried mines are practically undetectable except using man-portable or vehicle borne systems. Current technology does not make mines, even when surface laid, detectable by airborne detection systems.
- e. Both methods rely on trained users with appropriate technical support and backup. Training is a key issue to effectiveness.
- f. No one has yet produced a more effective detection device than a trained person equipped with a hand-held prodder. Although a preferred method in some cases, it remains a very slow and hazardous task.

13. Detector sensitivity is increasing and the advent of new technologies make it possible that all mines, including non-detectable ones, may be more easily found and identified.

CONCLUSIONS

14. Minefields for defensive or border protection are not substantially enhanced in their military effectiveness by non-detectable mines. When guarded there will be little or no difference in breaching time except in certain, specific and limited cases and if not guarded, breaching can always take place but at a slower pace. But in an unguarded area time is not a key factor and non-detectability will add little to the overall effectiveness of the barrier.

15. Protective mines laid by military forces engaged in war fighting may be of a pattern type, laid in slow time and often buried, or scatterable, required quickly and only for a limited time. Opposing forces may not have time to breach these obstacles by hand and will use mechanical or explosive methods instead. Detectable or non-detectable mines will make no difference to breaching time or technique.

16. Humanitarian organisations rely on unrestrained movement throughout an area. Quick, easy and reliable mine detection is key to their success. Non-detectable mines delay and disrupt their activities by slowing clearance and destroying their vehicles and killing and maiming their personnel. From this perspective, detectability is a must. Detectors that include metal detection as one means for locating mines remain essential to enable quick and effective humanitarian mine clearance. Non-detectable mines have a disproportionate effect on the speed with which a mined area can be returned to pre-conflict status.

17. No mines can be detected effectively by any but land-based systems. National or military security will not be significantly degraded by the use of 'detectable' mines. Nations may well save money, time and lives in the long-term if post-conflict clearance is made easier by requiring that all mines should be 'detectable'.
