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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Mines other than anti-personnel mines (MOTAPM)

Working Group on Mines Other than Anti-Personnel Mines

PROMISING TECHNOLOGIES FOR THE DETECTION OF EXPLOSIVE OBJECTS

Prepared by the Russian Federation

1. The Russian Federation has carefully studied the proposals made concerning detection of mines other than anti-personnel mines (MOTAPM).

2. There is considerable current discussion of the issue of the detectability of mines. However, this takes into account only one aspect of the issue, relating to the mine itself, which should contain at least 8 grams of iron. The Russian delegation has repeatedly explained its position with regard to this approach. This problem must be considered from a wider perspective and take account of prospects for the development of means of detection, as well as of the mines themselves.

3. Detection of mines is effected on the basis of indicators of their presence, which are secondary indicators. A number of factors can give rise to such indicators, the main ones being:

(i) The difference between the properties of the materials from which the mine casing is made and those of the medium in which the mine is placed;

(ii) The presence of metal in the structure of the mine;

(iii) The presence of an explosive substance;

(iv) The presence of an antenna with a radio receiver, in the case of radio-controlled mines;

(v) The presence of a timing mechanism or an electronic timer;

(vi) The presence of a control cable;

(vii) Irregular surroundings (disturbed soil or road surface, altered plant colours or snow cover);

(viii) A difference in temperature between the mine location and the surrounding area;

(ix) Characteristic mine shape.

4. Special equipment is used for mine detection (mine detectors, unexploded bomb detectors, etc.). Its mode of operation is based on a specific physical method of detecting one or more indicators of the presence of a mine.

5. Some 20 physical methods of mine detection are currently known in the Russian Federation, which vary in their level of development and readiness for practical use in detection equipment. The main types in the Russian Federation are:

(i) Metal detectors;

(ii) Non-linear transition detectors;

(iii) Nuclear quadrupole resonance apparatus;

(iv) Ground-penetrating radar;

(v) Detectors of evaporation from explosives.

6. Current discussions focus on metal detectors, but this is not ideal. The main requirement for their use is the presence of at least 8 grams of iron in the composition of the mine. They operate as follows: a receiving antenna is used to register the magnetic field of eddy currents (Foucault currents) provoked in metallic objects under the influence of an external magnetic field created by the transmitting antenna. The detection signal appears on an indicator.

7. This device does not detect mines which contain no metal. It works effectively only in certain conditions.

8. Experience in the use of metal detectors on sites contaminated with metal shows that in non-magnetic soils the device reacts to the presence of iron with a mass of 8 grams or more, leading to a large number of false alarms. In these conditions it is not effective.

9. The transmitting antenna of the non-linear transitions detector emits electromagnetic pulses which, when reflected from objects located in their path that contain electronic components, are detected by the receiving apparatus. These devices detect only mines containing semiconductor components.

10. The use of equipment based on ground-penetrating radar ensures detection of mines in any kind of casings on the basis of the difference between their electrophysical properties and those of the medium in which they have been placed.

11. The electromagnetic pulse emitted into the medium under study is reflected from the objects located in it or from irregularities in the medium whose permittivity or conductivity differ from those of the medium; it is detected by the receiving antenna and processed, and the data obtained are displayed on the screen.

12. The effectiveness of using this equipment is highly dependent on the type and humidity of the soil.

13. The mode of operation of equipment using nuclear quadrupole resonance is based on registration of high-frequency electromagnetic radiation provoked by the action of an external magnetic field on explosive substances. For each type of explosive substance a specific frequency of radiation is required. Currently this method requires considerable time for analysis and does not detect mines in metallic casings.

14. As a rule, mines contain between a few dozen grams and several kilograms of explosive. Consequently they can be detected by registering gaseous evaporation of products generated by the slow decomposition or evaporation of explosives. For this purpose use is made of evaporation detectors which detect the presence of explosives in the sample under study and their type.

15. When an air sample is taken and analysed, the data obtained are displayed on the indicator.

16. The level of effectiveness depends on natural climatic factors. On-site these means are ineffective because of the large number of false alarms caused by nitrocompounds.

17. Hence there are a large number of effective technologies for use in detecting objects which present an explosive risk. Each has its specific features, dictated by the physical principles which are used. They make it possible to broaden the range of factors used in detection of explosive objects to cover a wide spectrum of indicators, and not only the presence of 8 grams of iron.

18. Restricting the use of mines which do not contain a specific quantity of iron does not solve the problem of reducing mine risks. We still follow this approach for anti-personnel mines, but for MOTAPM laid at a depth of over 5 centimetres it is ineffective.

19. Of decisive importance in solving the “mine” problem in present-day conditions is work to improve technologies for the detection of mines and other objects which present an explosive risk.
