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

Sensitive Fuses for Anti-Vehicle Mines

(Overview of Fuses, Sensors and Recommendations for Best Practice)

Prepared by the Delegation of Germany

1. Regarding sensitive fuses, Germany believes that an agreement should be reached on suitable concrete technical parameters or limits (so-called “best practice”) for fuse and sensor mechanisms, which could reduce the risks of anti-vehicle mines to human beings. At the Fifth Session of the Group of Governmental Experts in June 2003, the Chairman requested further contributions by State Parties and asked Germany to incorporate these contributions into document CCW/GGE/V/WG.2/WP.2 with the aim to present an updated version.

2. As of today, we have received data from 19 States Parties, which have been processed and integrated in the attached synopsis, which also contains information provided by the ICRC (including hosted Expert Meetings), by Humans Rights Watch as well as by the Geneva International Centre for Humanitarian Demining. The matrix summarizes information received on those eleven types of fuses, which in the course of previous deliberations in the context of the Group of Governmental Experts have been recognized to be the most important ones. Double and triple-sensor fusing mechanisms are, however, not included.

3. Based on the contributions received and on the exchange of views, we suggest the following categorization:

- *First category*

Fuses or sensors, which cannot be recommended as a method of detonation, i.e. break wires, trip wires and tilt rods.

- *Second category*

Fuses or sensors, which could be improved by use in conjunction with other sensors, i.e. infra-red-sensors, seismic/vibration sensors and acoustic sensors.

- *Third category*

Sensors and fuses, which for proven reasons of technical reliability seem not to require embedding in a multi-sensor fuse concept, i.e. pressure sensors and fibre-optic wires.

- *Fourth category*

Sensors and fuses, which seem to be reasonably risk-free, *i.e.* magnetic sensors, scratch wire sensors and roller arms.

4. Notwithstanding the above mentioned preliminary conclusions, careful attention should be given to the following observations:

- Future MOTAPM could incorporate multi-sensor fuses technology in order to reduce the possibility of inadvertent or accidental activation. If a single fuse/sensor fulfills safety requirements as described, the incorporation of multi-sensor fuses should not be required.

- Environmental factors: The influence on the reliability (especially the sensitiveness) of the fusing/sensoring mechanisms of:

  - weather
  - climate,
  - storage, handling and other external conditions

should be taken into account while determining actuation thresholds.

- Considerations and proposals of technical measures should take into account military operational, procurement as well as life cicle factors; they should, therefore, be designed so as to address clearly identified humanitarian issues as opposed to unquantifiable theoretical risks.

5. We underline the need for action to raise the humanitarian standards for anti-vehicle mines within the framework of the CCW and so to reduce the risk to the civilian population.

Annex

Type of Fuse or Sensor	Best Practices	Risk Assessment	Technical Description
First Category	**Fuses or sensors which cannot be recommended as a method of detonation**		
Break Wire **Trip Wire** **Tilt Rod**	Not a recommended method of detonation for MOTAPM.	**Break wire**: Not possible to design in such a way that an individual does not (within reason) initiate the mine. **Trip Wire**: High risk to individuals. This fuse is easily activated by a person exerting a low pull pressure between 1 and 4 kg. **Tilt Rod**: Not possible to design in such a way that an individual does not (within reason) initiate the mine.	**Break Wire**: Laid loosely, usually but not always on the ground; when the breakwire is broken the mine explodes. **Trip Wire**: Tension (or release of tension) on wire causes mine to detonate. **Tilt Rod**: Pressure on and movement of a post or rod attached to a mine will detonate the mine.
Second Category	**Fuses or sensors which could be improved by using them in conjunction with other sensors**		
Infra-red sensor	Infra-red activated fuses should be designed so as not to be activated in the presence of a person. The sensor should be able to match detected heat signatures to the intended target in conjunction with other sensors.	While technically possible, there is no military utility in designing a MOTAPM with an infra-red fuse that can be activated by a person. Careful design entails a minimalization of risks to civilians; however, a risk remains for civilian vehicles.	Functioning in an active or passive role, the fuse reacts to the movement of heat from certain objects, or the interruption of a beam.
Seismic / Vibration Sensor	As such fuses cannot currently locate their targets precisely, conjunction with other sensors appears not to be dispensable. The sensor should be capable to match a seismic signature to the intended target.	The risk to civilians is dependent on the design of the sensor. Theoretically it is possible for seismic/vibration activated fuses to be activated by a person passing by.	Seismic/Vibration activated fuses respond to specific seismic frequencies in the ground.

Type of Fuse or Sensor	Best Practices	Risk Assessment	Technical Description
Acoustic Sensor	Acoustically activated fuses use electronic sensors to react to acoustic pressure and recognise the acoustic signature. Use in conjunction with other sensors is preferable.	The risk to civilians depends on the design of the sensor. If poorly designed, an acoustic activated fuse might respond to the noise caused by a person.	Technically it is possible for acoustically activated fuses to discriminate between a vehicle and a person.
Third Category	**Fuses or sensors which seem not to require embedding in a multi-sensor fuse concept**		
Pressure Sensor	Where possible these should be a minimum pressure force appropriate for the intended target, e.g. minimum 1.500 – 1.800 Newton. Where possible pressure should need to be exerted over a significant area (equal to that of a vehicle) rather than a single point.	Mines with a low pressure threshold, equivalent to or less than the pressure a person is able to exert, may pose a threat to civilians.	Actuation by pressure beyond a specified weight limit. Pressure may need to be applied one or more times (but not cumulatively).
Fibre-optic Wire	The pressure required to break the fibre-optic signal should be appropriate for the intended target.	The force acting on a fibre-optic wire is dependent on: - geometry of the object, which is squeezing the fibre-optic wire - characteristics of the ground (environmental condition).	Laid along the ground, when the fibre-optic cable is crushed by a weight being placed upon it (specifically tank track) the mine explodes.
Fourth Category	**Fuses or sensors which seem to be reasonably risk-free**		
Magnetic Sensor	To enhance military utility, magnetically activated mines should be capable of matching a magnetic signature to the intended target.	The risk to civilians depends on the design of the mine. While technically possible, there is no military utility in designing a MOTAPM with a magnetic fuse that can be activated by a person or small metallic objects. However, there will be a continuous high level of risk to civilian vehicles.	A magnetically activated fuse operates either by measuring the amount of metal in the immediate vicinity or by the change in magnetic field which such objects create when a vehicle approaches and drives over a mine.

Type of Fuse or Sensor	Best Practices	Risk Assessment	Technical Description
Scratch Wire Sensor	The scratch wire sensor should be designed for specific targets by optimising the scratch time, frequency and amplitude required to initiate the sensor by the intended target.	There is a very low risk to a person of activating the mine, unless there is deliberate tampering.	The scratch wire is activated by contact with a vehicle (usually on the bottom). The time to actuation is dependent on the velocity of the vehicle and the vehicle material.
Roller arm	The number of turns required to initiate the fuse should be matched to the intended target.	There is a very low risk of a person activating the mine, unless there is deliberate tampering.	Usually consists of an arm on which a multi-directional roller rests on top. Once the roller has been rotated a number of times the mine will explode.

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