GROUP OF GOVERNMENTAL EXPERTS TO PREPARE THE REVIEW CONFERENCE OF THE STATES PARTIES TO THE CONVENTION ON THE PROHIBITION 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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BLINDING WEAPONS:

EXPLANATORY MEMORANDUM TO THE PROPOSAL FOR A PROHIBITION

Submitted by Sweden

I. Introduction

The development of laser technology has been rapid. In most cases this development is of great benefit to civilian society, for example in the medical context. But the value of laser technology in the military context is also undeniable. Modern military equipment relies to a large extent on the use of laser technology, be it as range-finders, target designators, beam-riders, in laser gyros or in radar systems.

If a laser beam of a certain kind is directed against the eyes of a soldier, he is most likely to become permanently blind. A laser beam hits the eyesight with the speed of light. The soldier cannot be effectively protected against this invisible threat unless he wears a black patch. Eyesight is the most important of the human senses. There are no remedies if it is hit. The injury is irreparable and it will, in most cases, cause the soldier permanent blindness. The injury would, according to numerous military, legal and medical experts, be classified as superfluous injury and unnecessary suffering. Hence, such use could be claimed to already be prohibited under international law.

However, a general principle does not suffice when there is a need to draw a definite conclusion with regard to the legality or illegality of new weapons or weapon systems. In most cases, a general principle of law has to be supplemented with more specific regulations and laid down in an explicit provision in an international treaty. This is what the Swedish proposal, submitted in document CCW/CONF.I/GE.11, attempts to do.

II. Anti-eye use of laser devices on the battlefield and its effects

The target of this application is the adversary's eyes, either naked or behind magnifying optics. The aim is to immediately blind the soldier. The injury is intended to damage the eye to such an extent that the soldier cannot fulfil his duties. The more severe these injuries are, the bigger the burden to the medical facilities and the logistical infrastructure of the enemy.

Anti-eye laser use includes the systematic flash blinding, injuring, and destruction of the eyes of the enemy at ranges up to some kilometres. Present technology permits the production of small, light, hand-held, battery-powdered, and frequency-agile lasers. They will be designed for mass production and could be as cheap as a machine-gun or a rifle. Such a laser could be designed as an independent weapon or as a laser device to clip on ordinary rifles, machine-guns, and anti-tank weapons. The wavelength may either be tuneable or chosen in a part of the spectrum. There is no practical way of protecting the soldier, unless he wears a black patch.

There are many targets on the battlefield for anti-eye laser beams, including dismounted infantry acting in forward artillery controller teams, forward air controller teams, surveillance teams, commanders, and many other individual soldiers or teams. In fact, every soldier looking through a pair of binoculars, sights, or using his naked eyes to look in the direction of the enemy is at risk. This applies to an even greater extent at night. The eyes are adapted to the dark and therefore more sensitive, and it is easy to trick soldiers to look in a certain direction by showing a small light. These are only a few examples. There are many more situations in which a silent, more or less invisible anti-eye laser beam will be militarily effective. Civilians will certainly also be at risk if they are exposed to beams of this kind.

To blind an individual effectively it would be necessary to ensure that large, bilateral haemorrhages could be produced inside the eye-ball. It would be most effective if the haemorrhages were at the centre of the retina, especially in the fovea - the location of our capacity to see sufficiently to read, drive and work. It is possible to use the attention reflex to force the victim to look in the direction of the laser before the injuring pulse is fired. The attention reflex is very powerful and will inadvertently assist in directing the laser energy to the fovea. It is activated by movement, or a flash of light, in the peripheral field of view. The head and the eyes are moved so as to direct the gaze towards the movement thus ensuring that the retinal image which was in the periphery is now in the fovea. The requirement for a weapon of this kind is to cause central lesions. It might therefore increase the efficiency of the anti-eye application if visible, flashing light were associated with the laser system which can fire when a visual attention has been gained. The attention reflex takes about 0.5 seconds to execute, so the laser would fire about 0.5 to 1.0 seconds after the flash of light.

The choice of laser wavelength is important. The laser energy should not be attenuated by atmospheric mist, rain, fog or smoke, and must pass the optical media without much loss so as to form a focused retinal spot with sufficient energy to produce a haemorrhage.

This might lead to a multiwavelength laser system (0.4 - 1.4 nanometres) which would make provision of eye protection even more difficult. Alternatively, a laser which is tuneable to new wavelengths from shot to shot would have the same effect. Some laser types can also have their wavelength changed rapidly during an output pulse (chirping). One further possibility would be a system simultaneously emitting several visual wavelengths. It would be difficult to design protection against such a system while maintaining good visual function.

The duration of a damaging laser pulse is an important parameter in determining the type of retinal damage, because the ratio of the threshold energy for a haemorrhage to that for a just detectable thermal lesion decreases with pulse duration. More recent experimental work suggests that pulse lengths of about 1 or 2 nanoseconds are particularly dangerous as the risk of producing a haemorrhage is greatly increased.

The objectives of obtaining centrally-placed haemorrhages would be greatly enhanced if the laser fired repetitive pulses at a rate of several pulses per second. The production of one haemorrhage might be felt by the target soldier, in which case the aversion reflex would operate in about 0.25 seconds. Consequently, it would be necessary to pulse the laser at a rate of several times a second. Rather than attempt a regime of high repetition rates which rely for their destructive effects on summation from pulse to pulse being applied to the same place on the retina, it would be more dangerous if a scheme which produces a haemorrhage for each individual pulse was adopted.

Photocoagulations from industrial and military laser systems may far exceed those induced by clinical coagulators and therefore considerable damage to Bruch's membrane and the choroidal vasculature may occur. If Bruch's membrane is ruptured and the capillaries of the choriocapillaries are torn open by laser exposure, blood can escape forward into the retina or the vitreous part of the eye. The haemorrhage occurs within two or three seconds of the exposure, so visual defects, if they are apparent, will normally be noticed at once.

Low energy laser weapons could soon be deployed and used within all branches of the military service in many countries, although the numbers and levels of sophistication will vary. A number of articles have been published in open literature, describing the actual laser weapon projects, mentioned above, including small, frequency-agile and comparatively cheap laser weapons which look like a combination of a rifle and a video camera. Some of these projects will obviously constitute a very serious threat to human vision.

The number of eye injuries caused by conventional battlefield weapons during war have been limited in the past compared with other injuries. However, even this small number has increased from around 1 per cent of the total a 100 years ago up to 10 per cent in recent conflicts.

If anti-eye laser devices are deliberately deployed and used for anti-eye application on the battlefield there will undoubtedly be a further increase in the number of eye casualties. The exact numbers are impossible to predict, but if the infantry is supplied with these lasers and uses them in combat, there could be more than three to four times as many eye injuries as were registered during recent conflicts.

Only a few hospitals capable of providing the required treatment exist in peacetime society, even in industrialized countries. The number of ophthalmologists with the necessary training, surgical background, and operating facilities is far from sufficient. More personnel have to be trained, and more eye hospitals have to be built if we are going to be able to handle the consequences of the laser battlefield properly. It would certainly be a very long-term investment to begin training personnel and to establish new and expensive facilities that will not really be necessary during peacetime. Few countries, if any, will go to these lengths, which means that most of the injured soldiers will not get the best possible treatment. It can be expected that many soldiers will not get any treatment at all; even if a small chance existed to save some vision, it will be lost. Even in cases where proper medical treatment is administered, some of these injured will be permanently blinded for the rest of their lives due to the very severe nature of their injuries.

III. The Swedish proposal

The proposal submitted by Sweden in document CCW/CONF.I/GE.11 would, if adopted, bar the development described above. There exists a pressing urgency to prohibit this method of warfare before such weapons are actually deployed.

Sweden has no intention to deny access to or development of laser technology, be it in the military or in the civilian context. Such an approach would not be acceptable to any modern military force, including Sweden's armed forces.

What should be codified, however, is that the specific use of this technology to blind individual human beings is a violation of international humanitarian law.

The Swedish draft on blinding weapons is modelled on Protocol I on non-detectable fragments. Sweden has chosen to address blinding weapons as a matter of warfare rather than attempting to prohibit a specific weapon or weapons. The draft consists of only one sentence: "It is prohibited to use laser beams as an anti-personnel method of warfare, with the intention or expected result of seriously damaging the eyesight of persons."

Sweden considers it important and urgent that such an international norm be codified and does not propose that a verification regime be developed already at this stage.

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