Physical and Mathematical and Medico-biological Modeling of the non-lethal kinetic weapons' functioning and effects

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Since the year of 2000 the State Institute of Medical Officers' Postgraduate Education and Training by the RF Ministry of Defense (Moscow) is carrying out an experimental researches aimed to creating united methodology for testing the effects of non-lethal kinetic weapons on human organism and to determining classification of types and the threshold levels of its permissible effective influence that is not dangerous for human life.

Experimental studies were realized with the using of artificial simulated targets (blocks of petrolatum in mixture with paraffin) and on biological objects (swines) in accordance with the key aspects including physical and mathematical modeling of functioning and medico-biological modeling of the effects, being produced with this weapons.

When studying the vulnerability factors of kinetic weapons there were used principle provisions of physical and mathematical modeling of forming gun-shot injuries allowing to calculate the sphere of hitting, being formed with this weapons, by the character and spectrum of the elastic deformation waves being created by an injuring projectile into the target.

In the course of a given research, there was used an apparatus-program complex "Phoenix" for studying and diagnostication of the combat injury's rate of heaviness and also for determining the hitting qualities of modern fire-arms and protective qualities of an individual armoured safeguard. The above mentioned complex was elaborated by the Central Scientific and Research Institute of Precise Machine-Building (Klimovsk) jointly with The State Institute of Medical Officers' Postgraduate Education and Training by the RF Ministry of Defense.

The apparatus-program complex "Phoenix" consists of three modules:

1) module of specialist in ballistics – designated for registrating physical characteristics of an injuring element and waves of elastic deformation, which this element creates into the target;

2) module of resuscitationist – designated for registrating intracardiac pressure of biological object and for extrapolating the data received with the help of special software which permits to evaluate the dynamics of the biological object's circulatory system reaction and, at the same time, to determine the rate of heavi ness of the biological object's state;

3) module of surgeon – designated for evaluating viability of damaged tissues.

Under experimental conditions, the elaborated apparatus–program compex permits to determine the size of hitting sphere being created by kinetic weapons at

various distances of shooting and to compare it with the rate of heaviness of the biological organism's injury.

On the basis of the received results there was elaborated methodology of determining the non-lethal kinetic weapon's hitting effect with using an artificial simulated targets (blocks of petrolatum in mixture with paraffine) and also there was determined a permissible threshold of the non-lethal kinetic weapon's traumatizing effect on a human being.

Key words: *non-lethal kinetic weapons, damaging factors; nature modeling.*