

## NUMERICAL ANALYZES OF ARMOUR STEEL PLATES PENETRATION PROCESS BY SUBCALIBRE PROJECTILES WITH MONOLITH AND SEGMENTED PENETRATORS

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The penetration of segmented projectiles has become an area of considerable interest in penetration mechanics due to its speculated enhanced penetration efficiency. A segmented projectile is a cylindrical rod where the main material is separated by spacers, which are usually made of another material.

According to above restrictions, in the model of the subcalibre projectile with segmented penetrator (constructed by Military Institute of Armament Technology), was applied penetrator rod composed of the two tungsten alloy pieces connected by screwed steel muff (fig.1). The main destination of this solution is increasing the defeat possibilities of the composite (steel-ceramic) armour of the modern combat tanks.

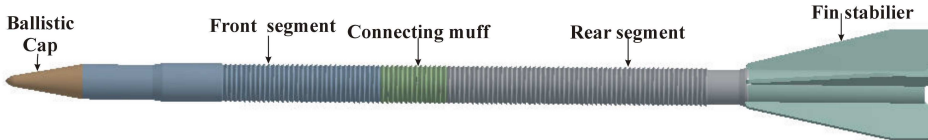


Fig.1. Subcalibre projectile with segmented penetrator

Composite armour (fig.2) is a type of vehicle armour consisting of layers of different material such as metals, plastics, ceramics or air. Most composite armour is lighter than their all-metal equivalent, but instead occupies a larger volume for the same resistance to penetration. It is possible to design composite armour stronger, lighter and less voluminous than traditional armour, but the cost is often prohibitively high, restricting its use to especially vulnerable parts of a vehicle.

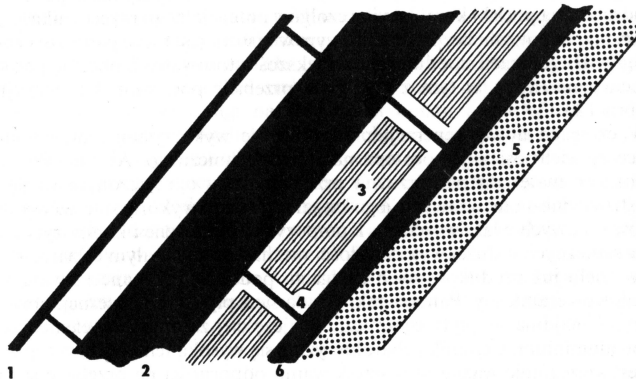


Fig.2. The cross-section of the typical composite armour.: 1 — front thin-walled plate, 2 — main steel plate, 3-ceramic elements, 4 — light alloy box, 5 — laminate layer, 6 — inertial steel plate.

In theoretical assumptions front segment of the penetrator, which hit the composite armour, is consumed during stationary hydrodynamic penetration process. The destination of the connecting muff is elimination of the shock wave propagated in front of the penetrator; which is transmitted to

the rear of the rod during hit. This wave, by the generation of the plastic deformations, has negative influence to the strength of the penetrator. In this way is possible that the structurally undisturbed rear segment could perforate the ceramic element and inertial layers of the composite armour.

Using a mathematical-physical model and computer code, a series calculation tests were performed concerning the problem of modeling of tungsten monolith and segmented rods penetrating steel targets. The computer simulations have been showed for two variants W2 – W3 (see table 1).

Variants number	Type of penetrator	Steel target thickness
W2	monolith	50 cm
W3	Two-segmented with steel connection muff	50 cm

Table 1. Configuration of the successive variants

In this paper, we present the computer modeling results of a steel armour plate's penetration by subcalibre projectiles with a monolith and segmented penetrators (tungsten alloy) accelerated to the velocity 1550 m/s. We used the most recent version of the free point's method. The results were compared to relevant experimental results. It is show that using this method we have obtained good consistency of the theoretical and experimental results