EXPERIMENTAL AND THEORETICAL ESTIMATE OF IMPACT CONDITIONS EFFECTS ON PROJECTILES DECELERATION HISTORY IN TARGET


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Using terminal ballistics accelerometry technology [1], data regarding projectile deceleration history during penetration into target for a number of specific cases was obtained. This data is used to determine dynamic mechanical material properties and for adjusting numerical models of impact processes [2].

Investigations made using specific realizations of electrical connection for obtaining data about values of registered parameters and their change during the time of impact are well-known [3-5]. Questions of accuracy and adequacy of registered parameters become important while using the data.

An estimation method of projectile-target mass ratio influence on data registered under conditions of direct and reverse impact is suggested.

An experimental analysis of incidence angle influence on parameters of electric signals registered with piezoaccelerometers was conducted; all other impact conditions were kept constant. Data for impact cases of elongated steel projectiles on steel targets with velocities higher than 1000m/s and incidence angle up to 65°.

REFERENCES
Supporting Material

Experimental and Computational Results

Experimental registrations of acceleration-time by means of terminal ballistics accelerometer measuring technologies (TBA-technologies) are shown. The continuous electrical connection system in Reverse Wire variant (RW, patent 1741082 RU) is applied. **Fig.1a** – rigid steel cylindrical projectile with ogive-nose head, steel target, velocity is 252 m/s. **Fig.2a** – rigid steel cylindrical projectile with conical-nose head (nose angle 60°), copper target, velocity 299 m/s. **Fig.3** - picture of impact result. **Fig.1b** – deceleration history \(-\frac{dV}{dt}\) (comparison of results) for direct (interrupted line) and reverse impact. **Fig.2b** – velocity \(V(t)\) and penetration depth \(S(t)\) (comparison of results) for direct and reverse impact. **Fig.4** – computation results for calculation of experimental kinematic parameters (uninterrupted line \(k_D \frac{dV}{dt} \); \(k_V - V\)) and time (interrupted line \(k_t\)) for direct impact case. Value \(\gamma_R\) – projectile mass relative to mass of modeling target.
Fig. 5 – eroding steel projectile (in 10-dia elongated rod form), steel target, normal impact, velocity 1100 m/s. Fig. 6 – eroding steel projectile (in 10-dia elongated rod form), oblique impact with angle 65°, steel target, velocity 1070 m/s. Fig. 7 – deceleration histories (comparison of results, interrupted line - oblique impact with angle 65°) for direct impact.