

Backhaus, J., Schweitzer, W. , Deimling, L.

Impulse Transport by Propagating Vortical Rings - Simulation and Experiments

Abstract

In respect of the NLW axiom there is a strong demand on new weapons to impact a subject without generating any serious harm. Projectiles based on solid materials like rubber or foam plastic can not fulfill these requirements sufficiently, for the effect depends strongly on operating distance and impact position on the target. These problems can be solved by using a propagating vortex ring to carry the mechanical impulse. This flow phenomenon enables the directed transport of an impulse through ambient air up to distances of more than 50 meters. Hitting a target the fluid structure disintegrates and transfers its impulse to the subject.

Numerical simulations are used to calculate the achievable amount of impulse depending on the propagating distance for a given generator geometry. Experimental setups for visualizing and measuring the impact of real vortex rings are shown and a comparison with the numerical results is given.