The ballistics of grenades is, among other factors, dependent on the aerodynamic drag. This aerodynamic drag is again dependent on the shape of the projectile and the flight conditions, i.e. the two infamous aerodynamic parameters Mach number and Reynolds number. The shape of a modern grenade is a compromise between aerodynamics and structural concerns especially during the initial blast.

Usually the drag of a blunt body is divided into forebody drag and base drag. The forebody drag consists of skin friction (viscous drag) and pressure drag (pressure losses over the projectile shape and wave drag caused by shock waves). The base drag occurs due to lower pressure than ambient pressure in the base area of the grenade, i.e. no pressure recovery beyond the abrupt cutoff of the projectile. Boat tailing will reduce the base drag, but for practical reasons, it is usually limited to a few degrees. Another well known method for reducing the base drag is by use of a base bleed, where small amounts of exhaust gas from pyrotechnics are introduced into the wake from a gate in the base, similar to tracers.

The flow out of the basebleed is subsonic, which means that the internal ballistics of the basebleed unit is coupled to the external base pressure. Base pressure controls the base drag. The coupling between base drag and internal ballistics is often given through empirical expressions.

In the present work, a physical and numerical flow field model for a grenade including an existing base bleed configuration is established. The aim of the study was to establish a physical model for the coupling between base drag and basebleed internal ballistics. CFD computations using various turbulence models in the wake zone have been performed. Predicted basedrag is sensitive to turbulence model and turbulence model parameters. Predicted results are validated against Doppler radar.
measurements. Comparisons show excellent agreement between measurements and predictions using detached eddy simulation (DES) model in the wake zone.

In order to increase the efficiency of the basebleed unit, i.e. increase drag reduction due to basebleed, various geometrical configurations of the basebleed have been investigated. The results show that the efficiency of the basebleed can be increased by introducing minor geometrical modifications to the base of the grenade, thus increased range for a grenade.