

## CUSTOMIZED ANALYSIS SOFTWARE FOR MUZZLE BRAKE OF A GUN

VERTICAL:  
**AEROSPACE & DEFENCE**

SERVICE:  
**CUSTOMIZED CAE  
SOFTWARE**

TECHNOLOGY:  
**CFD**

Our customer is a premier defense organization involved in the development of state-of-art hand-held and artillery guns. They are seeking to improve the efficiency of muzzle brake being designed by them. A muzzle brake is a device fitted to the muzzle of firearms which helps countering recoil of the weapon. Arriving at an optimal design by manufacturing prototypes is impractical. Numerical simulations serve as a robust and dependable alternative.

Zeus Numerix developed customized software, which used an unsteady compressible solver, on an Octree based grid, with Adaptive Mesh Refinement (AMR) to simulate the motion of the projectile. Dynamics and flow physics of the projectile starting from the all-burn point (inside the barrel), to the time where it reaches the end of the barrel is simulated. Parameters like the projectile's muzzle velocity and recoil energy were predicted within 7% of the experimental values. Noise levels at pre-specified locations were also predicted well via simulations.

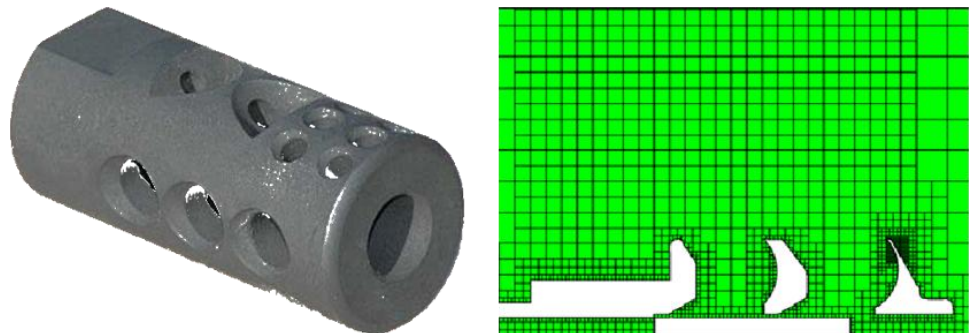


Figure 32: (a) A typical muzzle brake (b) Adaptive grid generated around a muzzle brake

The customer was provided with the customized software. It is a GUI driven software which a designer can use to produce geometry for muzzle-brakes, solve compressible flow (with AMR) to generate recoil forces and noise levels and post-process the solution data. The software has now become an integrated part of the design process of a hand-held gun and an artillery weapon manufactured by the customer.