

SECTOR:  
ROCKETS AND MISSILES

OFFERINGS:  
CUSTOM ENGINEERING  
SOFTWARE

TECHNOLOGY:  
FLUID DYNAMICS AND  
SOFTWARE DEVELOPMENT

## GUIDED MISSILE CONFIGURATION DESIGN USING CFDEXPERT-MISSILE

This work was pursued to demonstrate utility of *CFDExpert-Missile* for configuration design of state-of-the-art guided missiles. The design of an agile guided missile is a delicate balance between aerodynamic stability and control effectiveness from tail fin deflection. Therefore, precision guided missiles often employ multiple control surfaces such as tail fins, wings, canards and strakes. Reliable design of complex missile configurations is not possible using traditional DATCOM database, which gives very rough estimates of aero coefficients.

Zeus Numerix has developed a customized CFD package for quick and high fidelity aero analysis of missile and rocket configurations. Using backend scripts, the package generates structured mesh over complex missile configurations that may have any of the several of nose shape profile, control surfaces with deflection, wire tunnels and launch shoes. The quality of structured mesh makes it suitable for simulations for cruise conditions, for control surface effective, for high angle of attack aerodynamics and for estimating heat flux at leading edge surfaces.

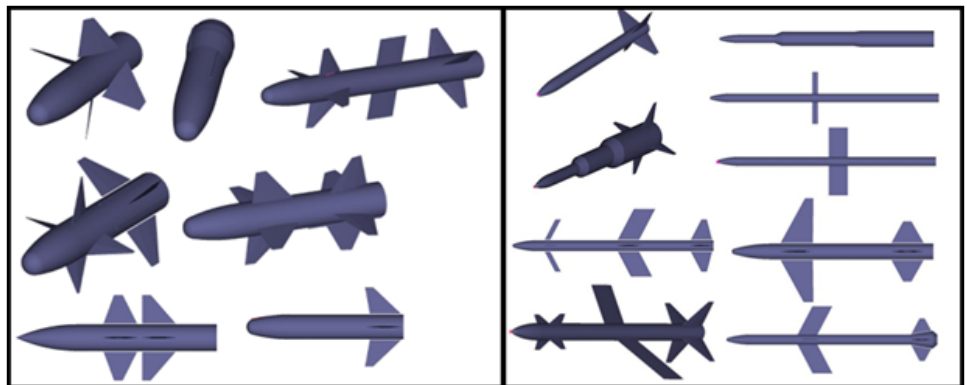


Figure 34: Versatility of CFDExpert-Missile in Analyzing Various Missile Configurations

One of our customers undertook a benchmarking exercise of CFDExpert-Missile against the wind tunnel data of an existing guided missile. The coefficients important of stability and control i.e.  $C_{N\alpha}$  and  $C_{N\delta}$  were predicted within 3percentage of wind tunnel values. Due to automation, the analysis (including geometry and mesh) could be completed within few hours. The customization of CFDExpert-Missile made it possible for system designers to evaluate aerodynamic data without entering complexity of CFD process.