

SECTOR:
ROCKETS AND MISSILES

OFFERINGS:
ENGINEERING SIMULATION
SERVICES

TECHNOLOGY:
FLUID DYNAMICS

ASSESSMENT OF NOSE SHAPE AND TAPER ON AERODYNAMIC STABILITY OF MISSILES

Our customer is engaged in development of strategic guided missile systems. These missiles will travel at hypersonic speeds with interception range up to 5000 Km. Such missiles do not feature control surfaces such as tail fins as they are ineffective in high altitude rarified atmosphere. Stability is ensured by correct selection of nose shape and appropriate taper at rear. During its preliminary design stage, it was decided to employ CFD method to find suitable configuration.

Zeus Numerix employed its proprietary CFD simulation tools for generation of stability coefficients. Structured multi-block mesh was generated using GridZ, whereas, in-house Navier Stokes compressible solver, FlowZ, calculated aerodynamic forces and moment at hypersonic speeds. The results were analyzed for stability margin and aerodynamic heating rates at nose region. The study considered multiple nose types as well as taper angles during design iterations.

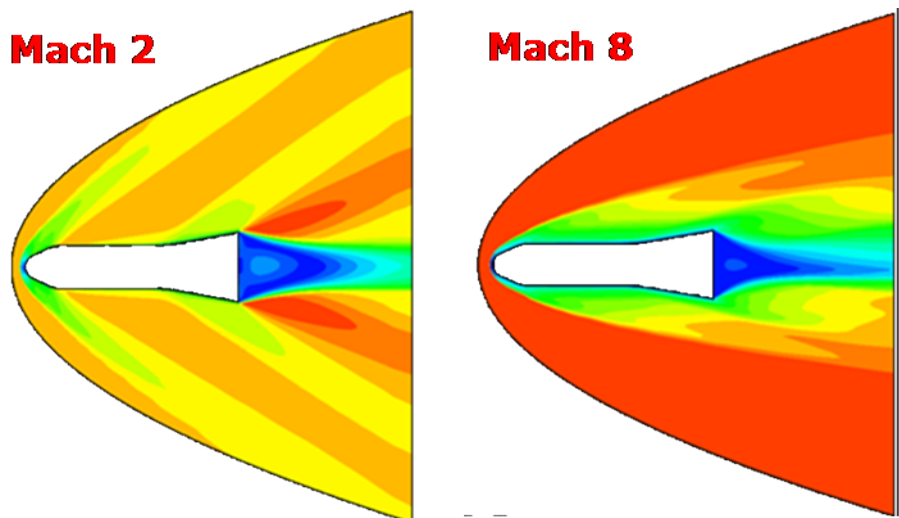


Figure 35: Validation results on a NASA benchmark configuration

Customer was delivered with a detailed aerodynamic study report. The report concluded with recommendation on nose shape and taper angle that provides stability margin during the glide phase of missile. The customer proceeded with design of other stage of the missile and detailed engineering.