

SECTOR:
ROCKETS AND MISSILES

OFFERINGS:
ENGINEERING SERVICES

TECHNOLOGY:
CFD + FEM

AERO STRUCTURAL ANALYSIS OF EXTENDED RANGE ROCKET

Our customer is a premier Defence establishment engaged in enhancing the capabilities of Multi Barrel Rocket Launch system for Indian Forces. They are targeting to increase the range of current rockets by 50percentage through use of additional propellant and associated design modification. The new rocket design is expected to experience large aerodynamic and inertial loads due to higher speeds and spin during the flight. This would cause structural bending and fin flutter that may result into trajectory deviation or rocket failure, something which should be avoided at design stage through a combined aero- structural analysis.

Zeus Numerix performed structural analysis of rocket at the flight condition that generates maximum aerodynamic load. The detailed aerodynamic load profile of rocket was obtained using high fidelity viscous CFD analysis performed on its proprietary software, whereas ANSYS v12.0 was utilized for FEM calculations. The novelty of the approach was development and usage of an in-house tool that transferred pressure load from CFD mesh onto the FEM Mesh, thus improving the accuracy of the results by considering local behaviors.

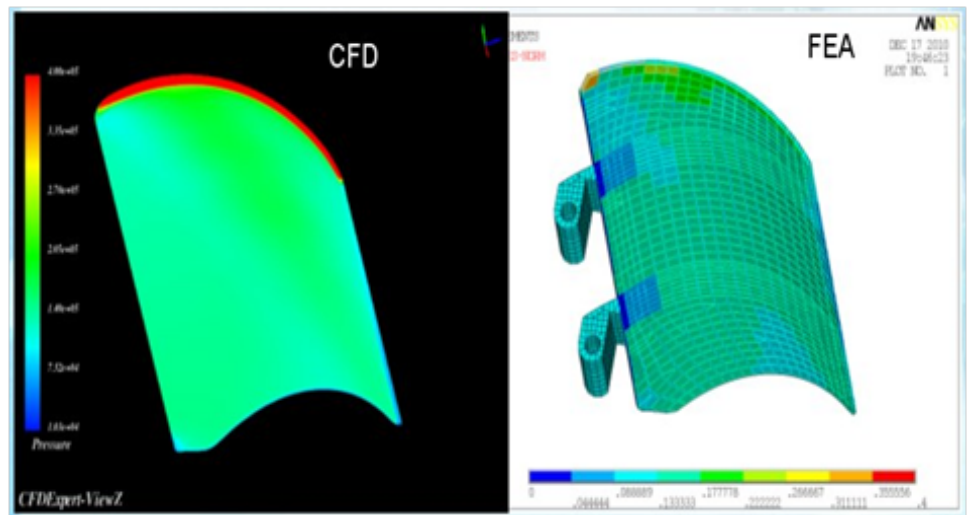


Figure: Transfer of CFD loads to FEM for rocket configuration

Customer was provided with aerodynamics coefficients, surface pressure distribution, rocket deflection and Von-Mises stress distributions. The highly stressed region over the fin was modified by the customer by varying its thickness. Through this study our customer was able to prove the structural integrity of his rocket design while aiming for higher range and speed.