

SECTOR:  
ROCKETS AND MISSILES

OFFERINGS:  
CUSTOM ENGINEERING  
SOFTWARE

TECHNOLOGY:  
FLUID DYNAMICS AND  
DYNAMICS & CONTROLS AND  
SOFTWARE DEVELOPMENT

## PERFORMANCE CHARACTERIZATION OF AIR BREATHING ENGINE

Our customer in Republic of Korea is engaged with conceptual design and development of supersonic air breathing engine. The engine is based on mixed-compression air intake, subsonic combustor, fuel injection system and a nozzle. A mathematical model was desired to be developed for estimating and understanding its working over its flight envelope. The development of such multi-component mathematical model required a multi-disciplinary group with deep expertise in development of numerical simulation tools.

Zeus Numerix selected the most appropriate techniques for component wise simulation and then integrated them all into a common framework for system level performance prediction. It included 3D CFD simulations for air intake, 1D detailed chemical kinetics of JP-10 for subsonic combustor and empirical modules for fuel injection and nozzle functioning. A novel system level dynamics framework to integrate the component modules was designed and implemented.

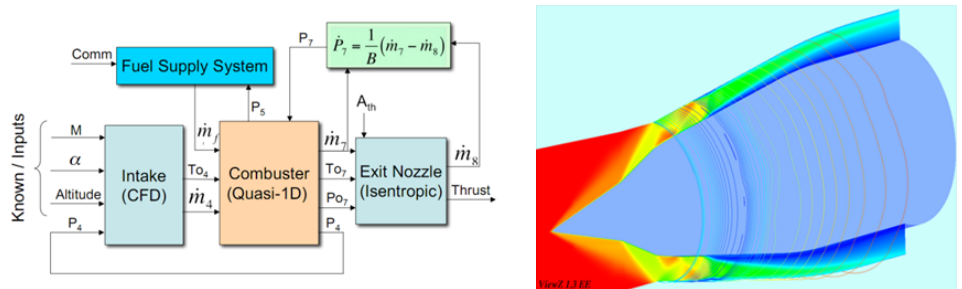


Figure 40: Global and local models for modeling of RAMJET engine

Customer was provided with a well-documented integrated framework, its validation studies and analysis report. The framework was further used by customer to devise control strategies for this engine. Through this engagement with Zeus Numerix, customer overcame the critical constraint on availability of research and development resources with expertise in development and usage of numerical methods.