

CUSTOMIZED CFD SOFTWARE FOR SCRAMJET ENGINE

VERTICAL:
AEROSPACE & DEFENCE

SERVICE:
**CUSTOMIZED CAE
SOFTWARE**

TECHNOLOGY:
CFD

Our customer is the nodal agency for development of satellite launch vehicles and are engaged in design and development of advanced propulsion concept namely, air breathing scramjet engine. Design of supersonic air intake is a critical aspect of scramjet engines, since it generates oblique shocks to forcefully compress and decelerate the incoming air before combustion. Estimation of flow slippage, pressure recovery and aero-thermal loads are important criteria on which design was required to be optimized.

Realizing the complex aero thermodynamics of hypersonic flow, Zeus Numerix relied on use of high quality structured mesh for obtaining RANS based CFD solution. Since manual generation of structured mesh was a cumbersome process, Zeus Numerix exploited scripting capabilities of proprietary GridZ™ to create an automated meshing module for scramjet intakes. 45 different geometry parameters including radii, included angles, lengths, heights and widths, were allowed as input to the automated package. None of the commercially available software could have automated this extremely complex mesh generation process.

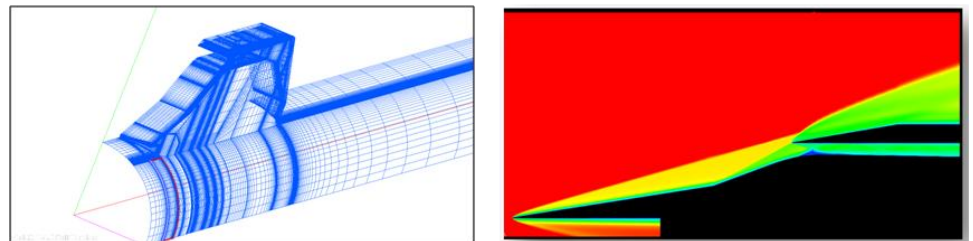


Figure 28: (a) Structured mesh supersonic intake (b) Shock patterns towards air intake

Customer was supplied the customized software after testing on 10 different geometries and flow configurations. The results were found to be consistent with the expected physics, as determined from experimental studies as well as empirical relations. This package is currently being used extensively towards optimizing the configuration of the air intakes, saving several months' worth of manpower.