

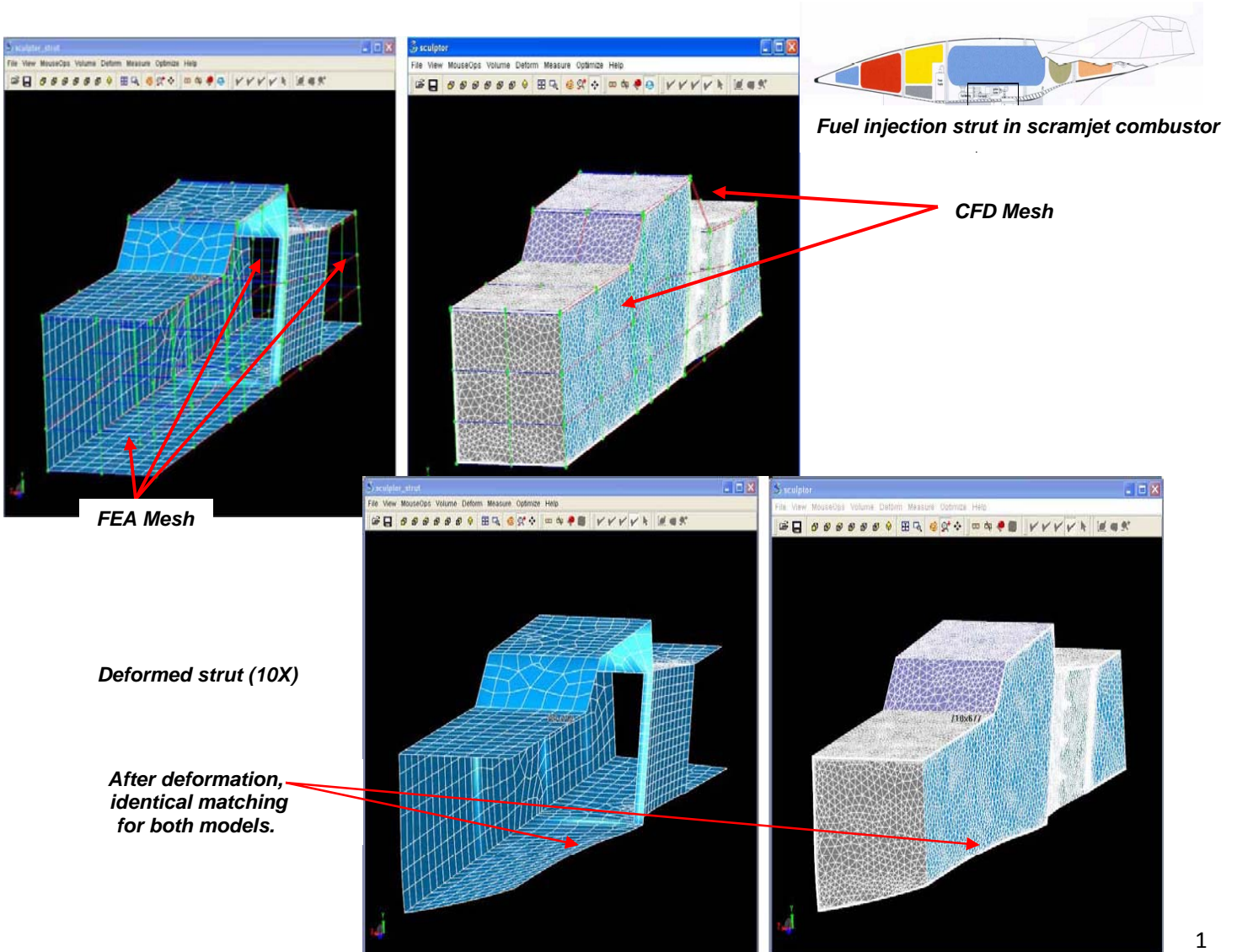
# OPTIMAL SOLUTIONS SOFTWARE, LLC Fluid Structure Interaction Case Study

**Sculptor** is now able to seamlessly link together CFD and structural analysis tools to solve fluid structure interaction (FSI) issues.

Typically, the fluid flow produces pressures and/or temperatures which deform the surrounding structure. In turn, these structural deformations change the fluid flow field. The ability for software to recreate the interaction of a flexible structure immersed in a flowing fluid field is a critical component of the design stage for many fields of engineering. FSI is vital in determining the stability and response of an aircraft wing, the response of a high-pressure sensor introduced into a pipe flow, or a down force generating wing on a racecar.

The importance of this design tool is often overshadowed by the difficulty to generate the numerical models for an FSI problem and the time required to establish a quality mesh. Modeling is further complicated by the dissimilar mesh requirements for the structural and fluid domains.

The solution for solving these types of problems was the result of a united effort between Optimal Solutions Software, LLC, and Engineous Software, Inc. in a joint Small Business Innovative Research (SBIR) project for Wright-Patterson Air Force Base, entitled "Improved Modeling Tools for High Speed Reacting Flows". The breakthrough of the project was the ability to integrate a CFD code with a structural finite element analysis (FEA) code utilizing **Sculptor** as the interface and deformation/optimization tool.



## Fluid Structure Interaction Case Study - Continued

Recently, Optimal Solutions arrived at an FSI solution looking at the optimization of the rear wing of an F1 race car in order to solve high-speed racing flow issues. The FSI was resolved within *an impressive three iterations of the below loop.*

### Automated Process

