

CUSTOMER:  
**Gencorp Aerojet Corporation**

INDUSTRY:  
**Aerospace**

PROJECT NAME:  
**Structural Dynamic Analysis of the COBRA Engine for Structural Analysis and Stress Calculations**

CUSTOMER LOCATION:  
**Sacramento, California**

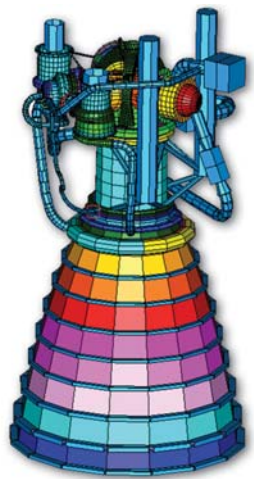
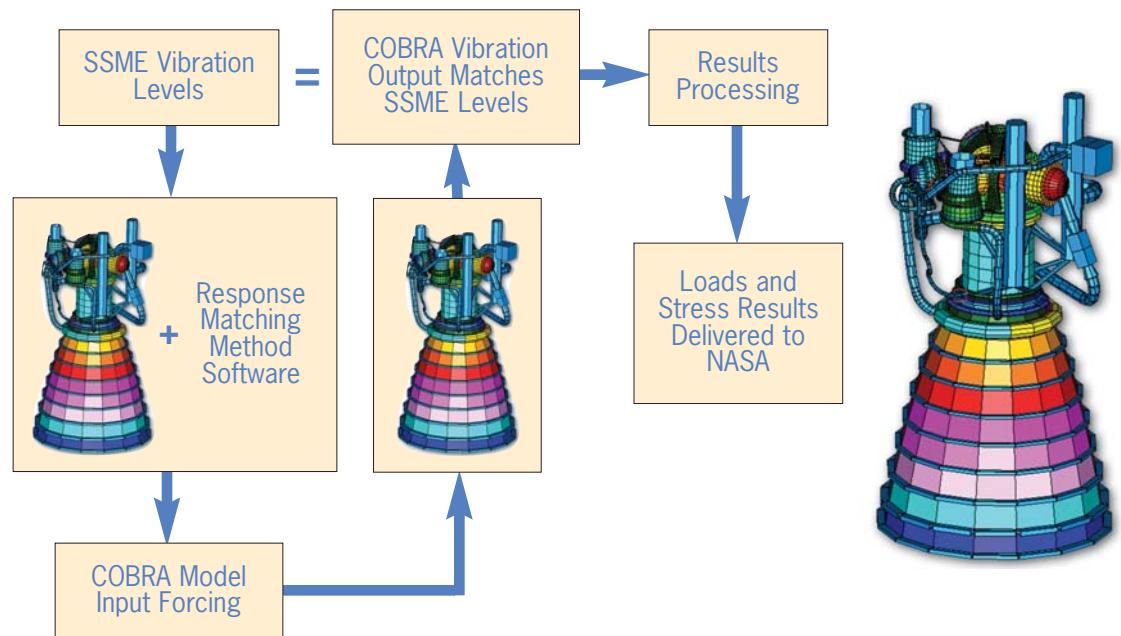
**OVERVIEW**

Aerojet and Pratt & Whitney were contracted to design and test a new booster for NASA's Space Launch Initiative. One engine design was the Co-Optimized Booster for Reusable Applications (COBRA), a liquid hydrogen/liquid oxygen engine designed to fire with 600,000 pounds of thrust.

ATA Engineering, Inc. supported Aerojet in the development of engine sine, random, and transient self-induced forcing functions using new methods based on the Space Shuttle Main Engine (SSME) data. Engine responses (maximum static and dynamic structural loads) were recovered for ground handling, startup/shutdown, and steady-state engine phases and provided important loads information to support design iterations.

**ATA SUPPORT INCLUDED:**

- ▷ Developed a system finite element model (FEM) for the COBRA engine from CAD models in parallel with the design process and updated the components as the design matured.
- ▷ Developed a response matching methodology and software to define engine sine, random, and transient self-induced forcing functions based on SSME measured vibrations.
- ▷ Performed static and dynamic analyses.
- ▷ Developed automated methods and software to process results quickly during design iterations.
- ▷ Completed load analyses for ground handling, startup/shutdown, and steady-state engine phases and calculated maximum interface loads for 28 engine interfaces.
- ▷ Delivered system loads for 10 design iterations and two formal Structural Loads & Environments Documents (SLEDs) to NASA.



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