



Images courtesy of SpaceX

CUSTOMER:
Space Exploration Technologies (SpaceX)

INDUSTRY:
Aerospace

PROJECT NAME:
Falcon I Launch Vehicle Loads and Detailed Stress Analysis

CUSTOMER LOCATION:
El Segundo, California

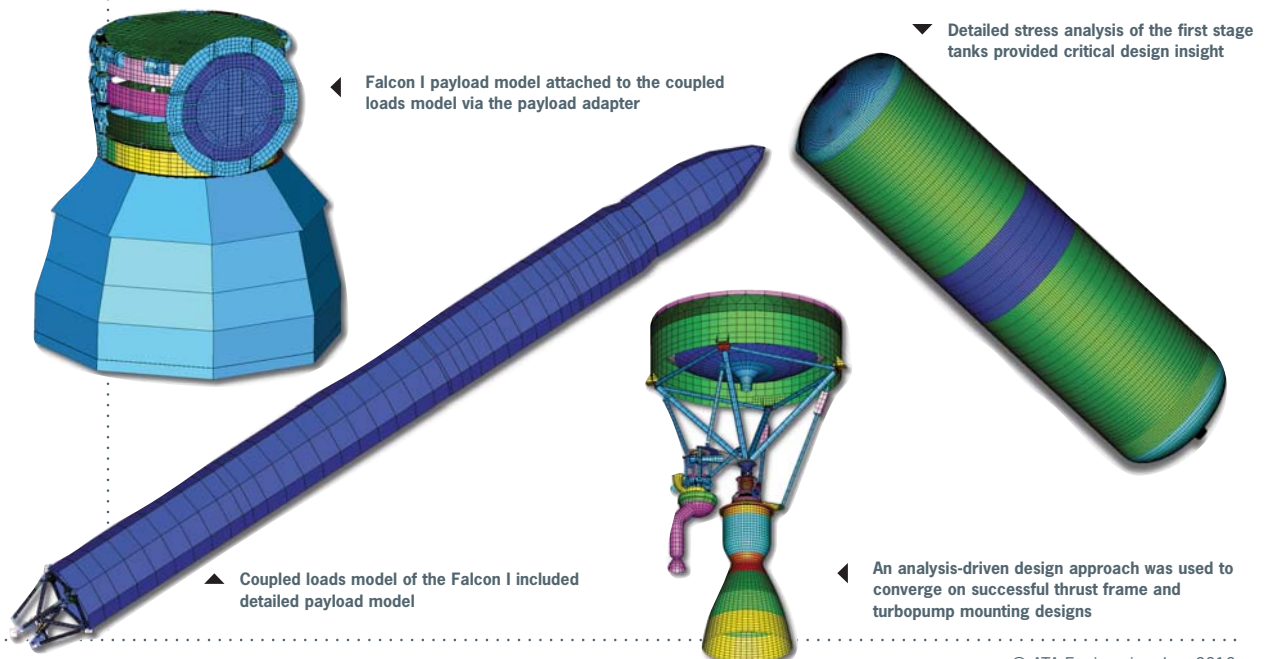
OVERVIEW

SpaceX is developing a family of launch vehicles intended to reduce the cost and increase the reliability of access to space ultimately by a factor of ten. Although drawing upon a rich history of prior launch vehicle and engine programs, SpaceX is privately developing the rockets from the ground up, including main and upper stage engines, the turbo-pump, the cryogenic tank structure and the guidance system, all within a highly compressed schedule which challenges the traditional aerospace development cycle.

The smallest of the family, the Falcon I, is a two stage, liquid oxygen and rocket grade kerosene (RP-1) powered launch vehicle. It is designed for cost efficient and reliable transport of satellites to low Earth orbit. ATA Engineering, Inc. (ATA) has supported SpaceX since December 2002 on a variety of structural issues including launch vehicle loads prediction and analysis of the first stage tanks and engine thrust frame. In addition, ATA also supported senior SpaceX technical staff on the implementation of methods and processes which increased the efficiency and accuracy of the dynamic and structural analyses.

ATA SUPPORT INCLUDED:

- ▷ Detailed stress analysis of the first stage LOX and fuel tanks under a variety of loads including ground wind loads and equivalent static launch loads.
- ▷ Nonlinear buckling analysis of first stage tanks and domes.
- ▷ Detailed structural analysis, and redesign, of engine thrust frame and turbopump attachments.
- ▷ Coupled loads analysis of vehicle and payload, including load environment set-up and loads documentation.
- ▷ Supporting SpaceX staff on the streamlining of modeling, analysis and post-processing of results for efficient advanced coupled loads and structural analyses.



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