

Testing and Analysis of the X-34 System



Case Study

OVERVIEW

OATK (formerly Orbital Sciences Corporation) develops a variety of advanced launch vehicles and satellites. ATA has supported OATK by developing structural-dynamic models and performing modal testing and analysis of most of their launch vehicles, including the Transfer Orbit Stage, Pegasus, and Taurus. The X-34 launch vehicle was an experimental vehicle designed to demonstrate reusable flight operations. It was to be launched from an L-1011 carrier aircraft and would achieve speeds of up to Mach 8 before returning to Earth and landing autonomously. ATA provided support to the X-34 program in a variety of areas, including design, testing, and analysis.

TASKS PERFORMED & KEY OUTCOMES

- Developed a system-level finite element model (FEM) of the X-34 from component detailed stress models provided by OATK.
- Performed a modal test of a total of seven configurations of the X-34 and L-1011.
- Modified the X-34 FEM to correlate to modal-test data.
- Developed a simple “stick” FEM of the L-1011 and modified it to correlate to test data.
- Performed a flutter analysis using the correlated L-1011 FEM and demonstrated results similar to those developed for the original certification of the L-1011.
- Performed flutter analysis of the coupled L-1011/X-34 system.
- Presented results to the FAA demonstrating that flight-flutter testing was not necessary, saving the X-34 program considerable schedule and cost.



Finite element analysis model of the X-34

“ATA was directly responsible for ensuring the success of our program and saving tens of thousands of dollars of recovered schedule.”
 Craig Huber, X-34 GVT Test Director, OSC



Ground vibration testing of the X-34 at OSC

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