Experimental Aircraft | Cutting Cost and Schedule on the X-34 Through Integrated Test and Analysis

CASE STUDY

CUSTOMER:
Orbital Sciences Corporation

INDUSTRY:
Aerospace

PROJECT NAME:
Testing and Analysis of the X-34 System

CUSTOMER LOCATION:
Dulles, Virginia

OVERVIEW

Orbital Sciences Corporation (OSC) develops a variety of advanced launch vehicles and satellites. ATA Engineering, Inc., (ATA) has supported OSC by developing structural-dynamic models and performing modal testing and analysis of most of their launch vehicles, including the Transfer Orbit Stage (TOS), Pegasus, and Taurus. The X-34 launch vehicle was an experimental vehicle designed to demonstrate reusable flight operations. It is launched from an L-1011 carrier aircraft and achieves 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. The X-34 project is an excellent example of how ATA uses a combination of test and analysis to best achieve a customer's objectives.

ATA SUPPORT INCLUDED:

- Developed a system-level finite element model (FEM) of the X-34 from component detailed stress models provided by OSC.
- Selected optimal sensor locations for a modal test of the X-34.
- Performed a modal test of a total of seven configurations of the X-34 and the L-1011 carrier aircraft.
- Modified the X-34 FEM to correlate to modal-test data.
- Developed a simple "stick" FEM of the L-1011 aircraft and modified it to correlate to modal-test data.
- Performed a flutter analysis using the correlated L-1011 FEM alone and demonstrated that we could match the results from the original certification of the L-1011.
- Performed a flutter analysis of the coupled L-1011/X-34 system to calculate captive-carry flight-flutter margins.
- Presented results to the FAA and convinced them 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
Orbital Sciences Corporation

▼ Ground vibration testing of the X-34 at OSC

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