

Ground Vibration Test and Structural Mode Interaction Assessment of an Aircraft



Image Courtesy of Tamarack Aerospace Group

Case Study

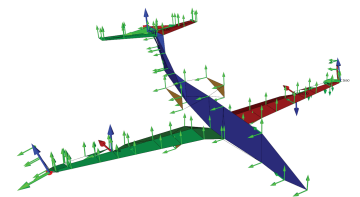
OVERVIEW

Tamarack Aerospace Group (Tamarack) does airplane modifications. In this project, Tamarack retrofitted specialized winglets, with active camber surfaces, to an existing airplane. That modification requires EASA and FAA certification of the aircraft. One of the steps in an airplane certification process is a ground vibration test (GVT), which provides dynamic characteristics of the modified aircraft for updating and validation of the analytical model used for flutter analysis. In addition to performing the GVT, ATA performed a limited structural mode interaction (SMI) assessment to provide an understanding of any possible interaction between the structural modes and the system that controls the active camber surfaces.

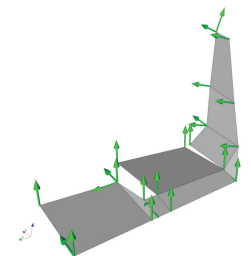
TASKS PERFORMED & KEY OUTCOMES

- Supported Tamarack's pretest analysis, which provided guidance for the testing.
- Instrumented airplane with 146 accelerometers at 119 locations.
- Excited airplane with four electromagnetic shakers: multipoint random and Multi-Sine.*
- Extracted modal characteristics of full aircraft modes as high as 90 Hz (50–60 modes).
- Performed supplemental modal test on wing extension/winglet assembly.
- Extracted modal characteristics of winglet modes up to 190 Hz (ten modes).
- Performed free-play test on the active camber surfaces of one of the winglets.
- Provided modal data for Tamarack's correlation activity and supported Tamarack in that effort.
- Provided insight on the potential for interaction between the structural modes and the active camber surface control system.

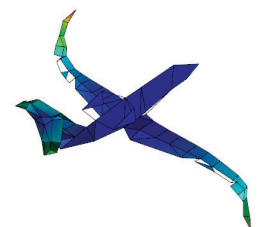
* ATA's patented Multi-Sine excitation method dramatically reduces ground vibration test duration. U.S. Pat. No. 8,281,659.



Measurement locations: Full aircraft



Measurement locations: Active camber surfaces



Example measured mode of vibration