Dr. Ronald O. Stearman  
The University of Texas at Austin  
Department of Aerospace Engineering  
Austin, TX 78712

Dr. Stearman:

The GVT (Ground Vibration Test) of the Star-Lite aircraft was completed on schedule. The GVT process provided much insight into the practical application of structural dynamics theory. The enclosed final report provides the theory behind our modal analysis, introduces the apparatus and test procedure used to troubleshoot the data errors and perform the GVT, and provides the results from the modal analysis in I-DEAS.

The first two months of the project were spent researching background theory on modal analysis in preparation for the GVT. In addition, the first two months included an extensive troubleshooting analysis of problems in data acquisition. The following problems were encountered in preliminary testing: ground loops, shaker rolloff, accelerometer mounting methods, bad wire connections, flexure vibration, nonlinear vibration of control surfaces, amplitude ranging, instrumentation overload, and bad data resolution. Once the problems were resolved, the excitation frequency range was defined as 0 Hz to 100 Hz, and the discrete measurement points were defined on the surface of the aircraft. Finally, the GVT data was recorded and imported into I-DEAS for the modal analysis.

The modal analysis produced twelve physical mode shapes for the Star-Lite. The polyreference time-domain technique was used to curve-fit the time-series data from the load cell and accelerometer in order to calculate the natural frequencies and modal damping. The polyreference frequency-domain technique was used to estimate the mode shapes of the aircraft. After all the modal parameters were computed, I-DEAS provided a modal animation of the aircraft. The results of the modal analysis in I-DEAS are provided in the enclosed final report. The original test data is available on the ZIP disk included in the project notebook.

Sincerely,

John M. Carson III - Team Leader and Systems Engineer

Ernesto Alvarez - Electronic Systems Engineer

Abraham T. Daniels - Computer Analysis Engineer