VTI Instruments Delivers Ground Vibration Testing Solution to International Aircraft Manufacturer

With more than 37.5 million commercial flights per year, aviation manufacturers are always pushing to increase the safety, efficiency, and comfort of their aircraft. To achieve the desired results, these manufacturers are continuously testing and improving their designs.

Completing these tests in-flight can be very expensive, dangerous, and often time consuming - leading manufacturers to complete these tests on the ground. Ground vibration test (GVT) systems allow for the testing of aeroplastic and aeroservoelastic stability of aircraft. The data collected is used to validate vibration, flight control models, detect structural flaws, and allow for the resolution of in-flight aeroelastic related abnormalities and troubleshoot flight control dynamic problems.

In November 2013, when an international aircraft manufacturer needed to complete their ground vibration testing, VTI Instruments was able to provide a high precision measurement solution.
THE CHALLENGE—PROVIDE A FAMILIAR SOLUTION

The customer required their new system to have dynamic signal analyzers with a 24-bit ADC, minimum of 400 channels, TEDS reading capability with a turn-key software, MAYA HTT’s I-DEAS test software integration capability, and custom interconnects that would interface with their existing connectors. Incorporating I-DEAS into the solution was essential as the software makes changing between acquisition and analysis mode simple, and is capable of performing modal analysis efficiently with many of its useful tools. VTI wanted to avoid creating a solution that would cost the company time and money associated with training but would meet the precision standards VTI is known for. To accomplish this, VTI had to create a solution that made use of hardware and software that the customer was familiar with.

THE SOLUTION—DELIVER AN ACCURATE, RELIABLE, CUSTOM SOLUTION

Prior to seeking the solution for their requirements, the customer’s GVT team was familiar with VTI’s VT143x digitizer product line and MAYA’s I-DEAS software as they were already using both for their GVT solution. Having used this combination of hardware and software for many years, the customer was aware of the reliability of both companies’ products as well as their excellent support. Furthermore, the decision-making process was made easier with VTI’s willingness and flexibility to provide the complete solution that included all the hardware, software, interconnects, and the system integration service with MAYA’s I-DEAS software.

The hardware solution consisted of:
- 3 x CT-400 13-slot chassis
- 3 x VXI-MXI-2 mainframe extenders
- 25 x VT1436 digitizer cards
- E8491B Firewire slot-0 controller
- Interconnects between the VT1436 front panel connectors and the connectors on the back of the system racks.

CHALLENGES
- DSA’s capable of 24-bit ADC
- Minimum 400 channels
- Incorporate I-DEAS software
- Custom interconnects to interface with existing connectors
- Provide a solution the customer was familiar with

BENEFITS
- Complete turn-key solution
- Reduction in training time
- Seamless integration with existing connectors
- Capable of using low sensitivity transducers
- On-board user-programmable DSP
- Higher bit resolution ADC providing higher sampling rate
- IEPE conditioning
The VT1436 is a 16-channel 102.4kSa/s 24-bit digitizer plus DSP with built-in IEPE conditioning, and it’s widely used in the test industry for its high-performance capabilities. The VT1436 is capable of using low sensitivity transducers with the 100 mV input range. Moreover, having an on-board user-programmable DSP gives a great advantage for the total system performance. Compared to the VT1432A cards that our customer had previously used, the VT1436 modules are more precise with a higher bit resolution ADC and have twice the sampling rate as well as the built-in IEPE conditioning. The VT1436 has a 24-bit ADC with the resolution of $2^{24}(16,777,216)$, while the VT1432A has a 16-bit ADC with the resolution of $2^{16}(65,536)$. The VXI-MXI-2 mainframe extenders were used to connect the three chassis together as one system, and the E8491B Firewire slot-0 controller was used to interface with the host PC. The TEDS reader software was developed to read the binary sensor information using the driver API and decode it to display the TEDS information such as sensor manufacturer, model name, serial number, and the sensor specifications. Combining VTI's low-risk, high performance hardware solution with MAYA's industry-leading I-DEAS software, our customer believed that it fit their requirements better than any other proposed systems from other manufacturers.
THE RESULT—A TURN-KEY GVT SOLUTION

Having provided test solutions to virtually all major aircraft manufacturers for many years, VTI Instruments had a proven solution that fit the customer’s GVT requirements as well as the extensive experience that they could rely on.

What makes VTI Instruments unique is their ability to leverage an extensive network and a quarter of a century worth of experience, while preserving their start-up roots. VTI works closely with companies to provide custom solutions as well as modified COTS and often creates commercially supported products as a result of custom requirements.

By trusting VTI’s demonstrated ability to deliver a high precision system, it provided less risk in the customer’s project schedule and lower overall cost. This opportunity was successful and beneficial to both companies and helped in establishing a good relationship between the two companies.

VTI Instruments delivers precision instrumentation for electronic signal distribution, data acquisition, and monitoring. The company continues to lead in the development of open standards for test and measurement along with scalable, modular products that maximize performance in a small footprint. With nearly two decades of experience primarily in the aerospace, defense and power generation markets, VTI helps customers maintain a competitive edge and preserve the integrity of their brand.