

**CASE  
STUDY**

*by Staff Writer John Hardy, Brüel & Kjær, a division of Spectris Technologies Inc., USA*

# Learjet to fly with PULSE



*Learjet stands alone atop the corporate jet industry because of a hard-earned reputation for quality and reliability. And Learjet is always looking for even more ways to improve the quality, safety, and comfort of their aircraft. That's where the Bombardier Flight Test Center in Wichita, Kansas, USA comes in.*

Bombardier's engineers are responsible for performing "production flight tests" on Learjets in which every possible acoustic and vibrational event is thoroughly measured and investigated. Recently, they purchased a 4-channel PULSE™ system (with a Dolch MegaPAC™ portable computer) for use during in-flight testing. The transducers on board the jets when taken up for tests include 2 Brüel & Kjær microphones, 21 accelerometers, and 4 probes for measuring the two speeds, N1 and N2, of each engine. The main goal once the PULSE system is mounted in the aircraft, as Jeffrey Fetter, Senior Engineer, describes it, is to feed the tacho information from the jet engine's main turbines into two of the PULSE channels along with any two of the other transducers and to analyse sound and vibration events aboard the aircraft to see if they are correlated with engine activity. Since everything is on a SONY®

DAT recorder, real-time analysis could be performed on four channels in-flight and all other channels could be analysed later by playing them into PULSE from the DAT recorder.

### PULSE in action

To date, PULSE has already been used in many instances for real-time analyses on areas of interest on these tapes. A pilot's headset is connected to the voice annotation channel on the SONY DAT recorder so engineers on board during flight can say, "Okay, we got a light right there" or make comments upon the occurrence of the slightest "whine, creak, or growl." On the ground, Mr. Fetter checks the FFT (Fast Fourier Transform) analyzer's spectrum at these critical points and can make a note of the frequency of the event. He then exports the spectra into Excel and in Universal File Format and records them on to a diskette to hand to design engineers. They can then make the decisions about where the noise may be coming from and what to do about it. Mr. Fetter's end goal is to produce such diskettes in the air so that when the plane lands, he will have a diskette he can immediately hand to the design engineers.

And to allow for even more powerful real-time analysis on board, Mr. Fetter is considering adding additional channels to Bombardier's PULSE system.



*Jeffrey Fetter, Senior Engineer, with a PULSE system computer inside a Learjet used for in-flight sound and vibration test. PULSE helped Mr. Fetter and his team of engineers find the quietest muffler for a heating vent into the passenger cabin from the engine. Eventually, the PULSE system will be connected to the aircraft's DC supply and taken up for real-time in-flight acoustic and vibration analyses*