

FOR IMMEDIATE RELEASE:

MicroStrain, Inc. Solar Powered Wireless Sensor Networks Monitor Bridge Spans

Williston, Vermont – August 14th, 2007 –

MicroStrain (www.microstrain.com) announces two major wireless installations which are actively monitoring the structural strains and seismic activity of major spans. Leveraging energy harvesting technology supported by the US Navy and Senator Patrick Leahy, the wireless sensors are powered by the sun, and therefore do not require battery maintenance.

MicroStrain has previously described battery powered wireless strain sensors for structural health monitoring (ref 1-3). One example is the Ben Franklin Bridge, which spans the Delaware River from Philadelphia, PA to Camden, NJ. The monitoring system was accessed remotely over commercial cellular telephone networks (Figure 1), and sensor data were provided to the customer via secure access to a web-based server. The wireless nodes measured structural strains in the cantilever beams as passenger trains traversed the span (Figure 2). These measurements were used, over a relatively short time period (months) to document the bridge's cyclic structural strains under contract from the Delaware River Port Authority (DRPA).

The endurance limit is the maximum stress threshold which may be applied to a material through an indefinite number of completely reversed stress cycles without failure. Repeated cyclic stress above the endurance limit will result in the gradual reduction of strength, or "fatigue"; therefore, bridges are designed to operate at stress levels below this limit. For the Ben Franklin Bridge, at the locations tested, the measured strains & calculated stresses were far below the endurance limit (Figure 3). From this information, DRPA engineers concluded that cyclic stress fatigue due to train crossings was not a problem (ref 4).

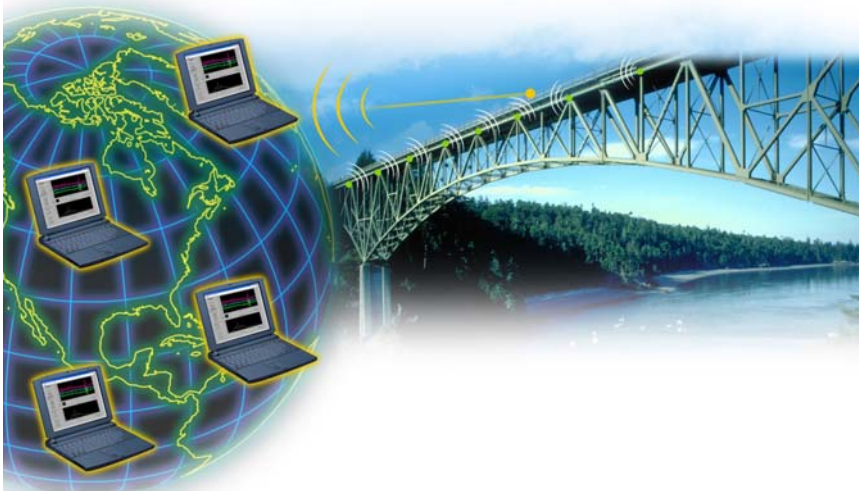


Figure 1. Remote highway bridge monitoring system.



Figure 2. Passenger trains crossing the Ben Franklin bridge. Four wireless nodes were placed strategically at each end of the span. Each node autonomously collected data from three distinct strain gauges per node (for 12 total strain measurements). Temperatures were also monitored at each node location.

Typical Data Print-out @ Location 2

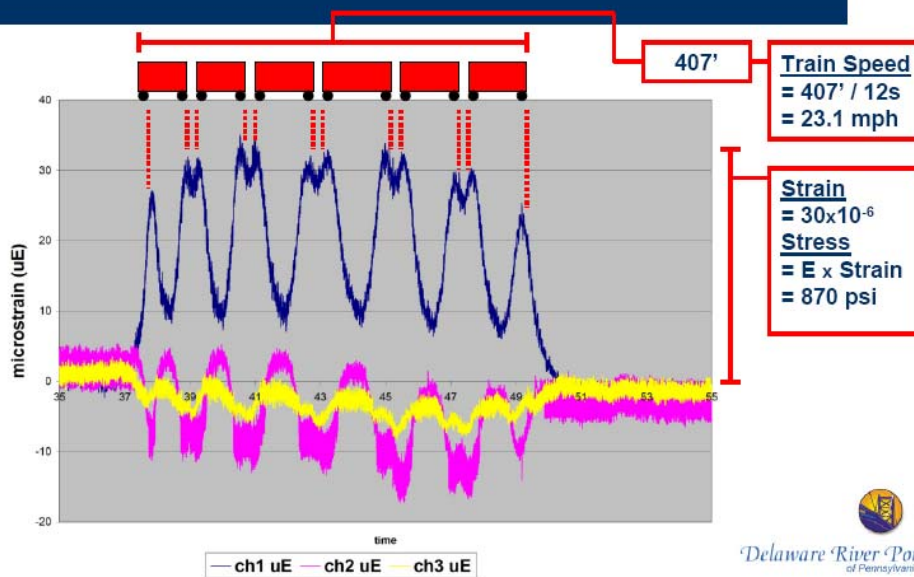


Figure 3. Typical strain data collected from location #2 from the Ben Franklin Bridge with train crossing (slide courtesy DRPA, reference 4). The strain pattern reflects the dynamic loads resulting from the train's axles into the bridge's instrumented cantilever beam steel supporting structure.

MicroStrain's first solar powered bridge installation was recently made in Corinth, Greece. This system uses arrays of wireless tri-axial accelerometer nodes (G-LINK®) to monitor the span's background vibration levels at all times. Each node and solar panel are packaged within watertight enclosures for outdoor use. In the event that seismic activity is detected at any one of the nodes, the entire wireless network of nodes is alerted, and data are collected simultaneously from the entire network. Photographs of this bridge and the wireless G-LINK® nodes as installed in Corinth are provided in Figures 4 & 5, below.



Figure 4-5. Solar powered wireless G-Link® seismic sensors on Corinth Bridge, Greece

The second solar powered installation is on the Goldstar bridge in New London, Connecticut, in collaboration with John DeWolf, Ph.D. of the University of Connecticut. This system monitors not only vibration, but also the strains and temperatures from key structural elements of the span (figure 6). Intended for long term monitoring, these new installations overcome the limitations of older types, which required that the wireless node's batteries be replaced or recharged periodically. Maintenance of batteries is simply not practical on bridges, where sensor nodes must be placed on, under, and within the structure in locations which may be extremely difficult to access.

The Connecticut Goldstar bridge program is a long term project developed to learn how bridge monitoring systems can be used for evaluation of in-service behavior, for long-

term structural health monitoring of each bridge, and for assisting the Connecticut Department of Transportation to manage the State's bridge infrastructure (ref 5).



Figure 6. Goldstar Bridge over the Thames River in New London, Connecticut. Multiple solar powered nodes monitor strain and vibration at key locations on this structure.

“We’re excited to take on challenging civil engineering applications”, said Steve Arms, MicroStrain’s President. “Our latest developments of robust, wireless, energy harvesting structural monitoring systems for Navy helicopters are directly applicable to the realization of advanced structural monitoring systems for our Nation’s infrastructure. We’re actively working to transition our technology to the civil engineering community”.

About MicroStrain Inc.

MicroStrain is a privately held corporation based in Williston Vermont. MicroStrain produces smart, wireless, micro-miniature displacement, orientation and strain sensors. Applications include advanced automotive controls, health monitoring, inspection of machines and civil structures, smart medical devices and navigation/control systems for unmanned vehicles. For further information please visit MicroStrain’s website at www.microstrain.com or call 802-862-6629.

References:

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- 5) DeWolf, J.T.; "The Long Term Structural Health Monitoring of Bridges in the State of Connecticut", Third European Workshop on Structural Health Monitoring, Granada, Spain, July 5-7, 2006 (abstract hyperlink: <http://atlas-conferences.com/c/a/r/b/96.htm>)

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