

**SBIR Topic Number:**  
AF03-252

**Title:**  
Miniature Absolute  
Pressure Transducer

**Contract Number:**  
FA9101-04-C-0030

**SBIR Company:**  
Kulite Semiconductor  
Products, Inc.,  
Leonia, NJ

**Technical Project  
Office:**  
AEDC, Arnold AFB, TN

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR technology that met topic requirements and has outstanding potential for Air Force and DOD.



Successful demonstration of the manufactured 5 psi transducer was performed at AEDC in both Precision Measurement Equipment Lab and in Hypersonic Wind Tunnels B & C.

## Miniature Absolute Pressure Transducer To Aid Hypervelocity Wind Tunnel Testing

- New transducer does not require in-situ calibration to achieve specified performance and is easy to install/remove while not requiring extension pneumatic interconnects.
- Besides enabling highly accurate wind tunnel pressure measurements, the broad range of potential applications include flight test, aircraft engine and rocket engine development.

AEDC-PA #2006-162

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### Air Force Requirements

The objective of this SBIR effort was to develop miniature absolute pressure transducers for installation in hypervelocity wind tunnel test articles. Typical flight performance studies using hypervelocity wind tunnel test articles involve the measurement of very low pressures at elevated temperatures. Current technology allows for the measurement of these pressures, but many sacrifices must be made in order to achieve a reasonable level of accuracy. Normal pressure installations require extensive preparation, lengthy tunnel installation, in-situ pressure calibrations and continuous on-line system verification. A solution to rapidly install, measure, and transmit flight performance data was needed. This solution should connect to existing analog data acquisition systems and accurately measure pressure in a hypersonic test environment (range 0 to 5 PSIA, temperature 50 to 250 Fahrenheit) in a small form factor.

### SBIR Technology

Kulite has developed, manufactured and demonstrated a novel high accuracy, miniature absolute piezoresistive pressure transducer. The sensor utilizes the patented Silicon-on-Insulator (SOI) Leadless Technology that was optimized to allow the extremely high accuracies in the five psi range, while enabling the transducer to be less than 0.2 cubic inches and providing a quick connect/disconnect capability. The specifically optimized electronics, contained within the transducer, provides an amplified signal with an overall transducer accuracy under 0.1% error band.

### Potential Air Force Impact

The initial delivery of five transducers from Kulite supported measurements in conjunction with the existing pressure measurement system. The Kulite transducers outperformed the existing system by a factor of six when compared to a high-accuracy verification pressure standard in the test cell. Current and future testing of hypervelocity wind tunnel test articles in ground test facilities will make use of these transducers from Kulite. The development of high accuracy miniature absolute sensors under SBIR Phase I and Phase II funding has allowed the identification of a broad range of additional applications. Flight test, aircraft engine development and rocket engine development are potential Air Force uses. Additionally, this work has lead to a myriad of future opportunities where very small, low-cost, rugged design, highly sensitive, and highly accurate detection is required.

### Company Impact

Kulite has benefited from the SBIR project funded by the Air Force. The development provided through these contracts has lead to new applications such as Wind Tunnel test and evaluation, Flight Test and Aircraft Engine testing and development. This sensor development has been instrumental in moving this important technology closer to commercial applications, and in fact, has resulted in commercial products and has helped Kulite to further develop its sensor related industry expertise in this area, as well as leading to increased revenues and exposure.



U.S. AIR FORCE

# SBIR/STTR

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