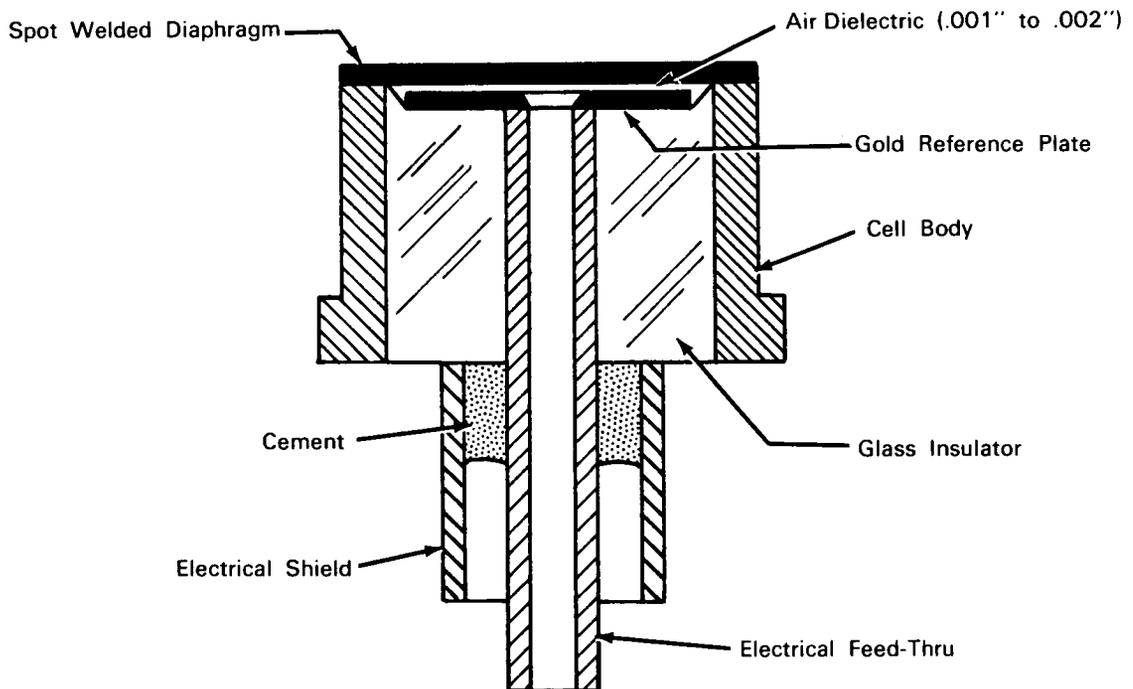


# NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

## Welded Pressure Transducer Made as Small as 1/8th-Inch in Diameter



**The problem:** Construction of a miniature differential pressure transducer small enough to put in a wind tunnel model and still have desirable response characteristics. The transducer must be rugged and relatively low in cost.

**The solution:** Capacitance transducers as small as 1/8th-inch in diameter, made by a special spot-welding technique and having a flat response (within five percent) up to one-third of the resonant frequency.

**How it's done:** The smallest transducers possible are required in shock-tube, wind tunnel testing when conducting experiments on boundary layer flow.

Small transducers cause a minimum of disturbance in the airflow. Capacitance cells as small as 0.12 inch in diameter, having a diaphragm thickness of 0.0005 inch, and a sensitivity as low as plus or minus 1 lb/in.<sup>2</sup> have been made by this method. Resonant frequency is 34,000 cycles per second.

The center electrode and glass insulator are recessed below the level of the outer body shell approximately 0.003 inch. A conducting gold film is painted over the center of the insulator and the center electrode, then baked to form the stationary capacitance-sensing plate. The diaphragm (in a stretching frame) and the

(continued overleaf)

body of the transducer are mounted in the indexing head of a commercial condenser-discharge spot welder. Spot welds are placed about one electrode radius apart. Distortion from local heating and local burning of the diaphragm are reduced by the addition of a small droplet of water under the spot-weld electrode.

**Notes:**

1. Techniques developed in the process of welding the transducer diaphragm to the transducer cell body may have other applications in miniaturization technology. Welded electronic modules appear to be one possibility.
2. Capacitance transducers have been found in this work to be more desirable than reactive or resis-

tive transducers because the capacitance type is simple mechanically and generates less electrical heat. In addition, the welding technique avoids manufacturing problems associated with the method of machining the cell body and diaphragm from a single block of material.

**Patent status:** NASA encourages the commercial use of this invention. It was invented by a NASA employee and U.S. Patent Number 3,027,769 has been issued to him. Inquiries about obtaining license rights for its commercial development should be addressed to the inventor, Mr. Grant W. Coon, of Ames Research Center, Moffett Field, Mountain View, California.

Source: Ames Research Center (ARC-11)