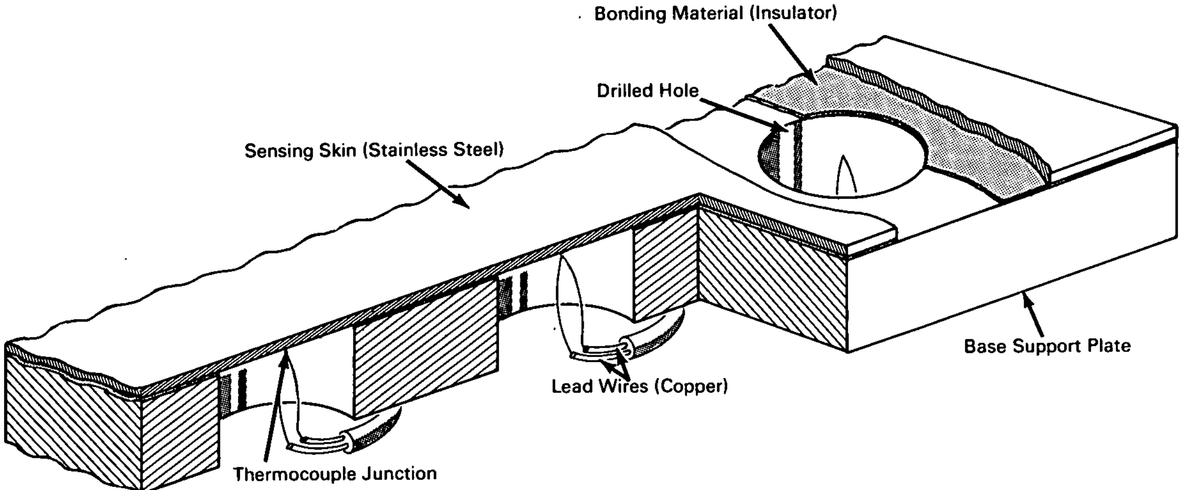
NASA TECH BRIEF

Instrument Accurately Measures Small Temperature Changes on Test Surface



The problem:

To devise an accurate method of measuring very small temperature rises (on the order of 1° to 2°C) occurring over time intervals of approximately 0.1 second on a test surface subjected to aerodynamic heating.

The solution:

The method involves the attachment of a continuous thin sheet of a sensing material to a base support plate (model body) through which a series of holes of known diameter have been drilled. When thermocouples are attached to the sensing material through the drilled holes, each disk of sensing material serves as an individual calorimeter.

How it's done:

The steel support plate, machined and ground smooth on one face, is drilled with 0.25-inch diameter holes at specified locations to accommodate the thermocouples. A 0.001-inch thick bonding material similar to double-backed tape is used under controlled temperature and pressure to attach the 0.002-inch thick 302 stainless-steel sensing skin to the support plate. This construction provides a smooth, uniform thin-skin surface, which serves as a calorimeter-type heat-transfer gage at each of the 0.25-inch hole locations. Chromel/alumel thermocouple wires (0.001-inch diameter) are then resistance welded onto the back side of the thin skin as near the center of the disks as possible. Copper lead wires of much larger

(continued overleaf)

diameter are joined to the 0.001-inch diameter thermocouple wires.

Notes:

1. The output signals from the thermocouples are of sufficient amplitude, so that the thermocouple lead wires can be directly connected to a sensitive galvanometer and oscillograph readout system.
2. This type of construction should be applicable to other geometries such as cylinders, wedges, and irregular shapes.
3. Further information concerning this instrument is given in NASA TN D-2846, "Effects of Leading-Edge Bluntness on Pressure and Heat-Transfer Measurements Over a Flat Plate at a Mach Number of 20", by William D. Harvey, October 1965, available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Inquiries may also be directed to:

   Technology Utilization Officer
   Langley Research Center
   Langley Station
   Hampton, Virginia 23365
   Reference: B66-10637

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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