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NASA TECH BRIEF

Ames Research Center

Mounting Technique for Pressure Transducers Minimizes Measurement Interferences

The problem:

The ordinary pressure transducers and mountings that are used to measure shock-pressure oscillations and other dynamic flow conditions on the wing of an aircraft in transonic flight are so large that local flow patterns are altered and pressure measurements are rendered inaccurate.

The solution:

Use miniaturized semiconductor pressure transducers housed in a plastic jacket that can be mounted smoothly on an aircraft wing.

How it's done:

The miniaturized differential pressure transducers are fabricated from commercially available four-arm semiconductor gages; the transducers are connected as a bridge circuit and mounted on the internal face of a small diaphragm (0.64 cm). For units which have a nominal pressure range of 17,000 N/m^2 (2.5 psi) and an overrange tolerance of twice the range, the transducers typically are about 0.076 cm thick and 1.27 cm long. Each transducer includes a reference pressure outlet connected to a reference source; thermistors and resistors located within the transducers provide temperature compensation for the dynamic scale factor, but design improvements are required if temperature-induced drifts of the null-pressure signal must be minimized.

All transducer harness wires and reference-pressure tubings are assembled and attached to the wing surface; electrical conductors and tubings are led into the internal space of the wing structure through rivet holes. Strips of 1-mm clear plastic about 30-cm long are used to fabricate a jacket for the transducer array; the plastic strips are machined or undercut to form channels which bridge the transducer harnesses and tubings, and oversize circular holes are cut in the outer surface of the plastic sandwich where pressure transducer diaphragm openings are located. A 15-to-1 taper is cut on the jacket periphery to minimize flow interference. The jacket is trimmed, fitted over the harnesses and tubings, and bonded by adhesives to the wing surface. Then the transducers are connected to the wirings and tubings and cemented in place. Pre-cut metal plugs are fitted in the diaphragm holes to act as fillers and to form a smooth airfoil surface on the wing.

A jacket made of conductive plastic may need to be used to avoid buildup of static charges, but the roughness of a conductive plastic must be taken into account when interpreting flow measurements.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP 75-10145

Patent status:

NASA has decided not to apply for a patent.

Source: Ray N. Lanham, Charles E. Taylor, Carl E. Balmer, and Chintsun Hwang of Northrop Corporation/Aircraft Division under contract to Ames Research Center (ARC-10933)

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