visualization signatures for determining the various regions of investigation of stability and transition. Brown [D1] correlated hot-wire signals with flow motion which precedes transition in a free shear layer. Thus, the utilization of several measurement techniques for improved information flow in experimental fluid mechanics has some precedence. The use of this technique by Professor Falco for the investigation of topics of current interest is encouraging, and, hopefully, it will be used even more frequently in the future.

Additional References


A Four Hole Pressure Probe for Fluid Flow Measurements in Three Dimensions

M. W. McBride. The velocity vector measuring probe developed by I. C. Shepherd represents a technique which should find a wind range of application. The four-hole probe has advantages over five-hole probes in that fewer data are required and smaller head volumes are possible. The problems associated with the use of these probes should prove to be equivalent to those experienced with five-hole probes. Comprehensive discussion and examples of Reynolds number and near-wall effects may be found in reference [D1]. The effects of high shear rate and turbulence levels are presented in reference [D2]. Both references measure flows associated with rotating turbomachinery in the relative and absolute frames of reference. Comparisons are made with data acquired by other means. In the cases cited, the four-hole probe would have reduced the data handling and test time required.

Measurements of flow with some axial symmetry could be facilitated by use of the four-hole probe. However, the accuracy of the probe and data reduction system requires calibration quadrants seems cumbersome and could be replaced by a method which requires only a single calibration quadrant. Coefficients based on three indicated static minus total pressures will be well behaved and may be correlated in either rectangular or spherical-polar coordinates. In the last case, the indicated pitch angle is nearly constant with circumferential angle, and the method requires two sets of calibration curves. These curves are fitted with cubic splines and are well behaved.

The accuracy of the probe and data reduction system measuring unknown flows should be documented by direct comparison with measurements taken by independent methods. The laser doppler velocimeter has been shown to produce accurate velocity component measurements and does not suffer from probe response time limitations. Both four and five-hole probes should be compared to LDV data before judgment of absolute accuracy in time dependent flows is made. This is especially true when turbulence levels of ten percent or higher are present.

In conclusion, the four-hole probe offers a relatively simple method of measuring three dimensional flow fields when limitations of use and accuracy are properly taken into account.

Additional References