

SEMI NULLING CALIBRATION OF A FIVE HOLE PROBE

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Abstract

Five hole probes are extensively used for measuring three dimensional flows. However the useful range of the probe is limited to about $\pm 30^\circ$. In many flows, this range may be exceeded. In such flows, a seven hole or even a nine hole probe is required increasing testing time or using alternative methods. The objective of the present paper is to find one such alternative method for use of five hole probes in highly three dimensional flows. A large size probe is manufactured and calibrated in an open jet calibration tunnel at a velocity of 40 m/s in yaw angle range of $\pm 90^\circ$ and pitch angle range of -70° to 90° at an interval of 10° . The probe calibration data is used for nulling calibration with zero yaw angle and pitch angle range of about $\pm 70^\circ$. This method is time consuming. Hence a semi nulling calibration method is developed. This method is similar to non-nulling calibration method. However the range of yaw angle is limited to $\pm 20^\circ$. If the flow yaw angle exceeds this yaw angle range, the probe can be rotated, so that the probe can be used to measure flows with large yaw and pitch angles. The calibration curves of semi nulling method are compared with those of zonal non nulling calibration method. It is found that the pitch angle range of non nulling calibration method is one pitch angle interval less than that of semi nulling method.

Keywords: Five Hole Probe, Nulling Method, Semi Nulling Calibration, Non-nulling Calibration