DESIGN, FABRICATION, CALIBRATION AND VALIDATION OF A NINE HOLE PROBE FOR MEASUREMENT OF FLOW WITH LARGE ANGLES

N. Sitaram
Turbomachines Laboratory
Department of Mechanical Engineering
Indian Institute of Technology Madras
Chennai-600 036, India
Present Address : School of Aeronautical Sciences
Hindustan Institute of Technology and Science
No.1, Rajiv Gandhi Salai (OMR), Padur
Kelambakkam (Via), Chennai-603 103, India
Email : nsitaram.iitm@gmail.com

M. Venkatesh Babu
Turbomachines Laboratory
Department of Mechanical Engineering
Indian Institute of Technology Madras
Chennai-600 036, India
Present Address : Flat No. 616
MVV Ozone Apartment
Midhilapuri Vuda Colony
PM Palem, Madhurawada
Visakhapatnam-530 041, India

Abstract

The design and fabrication details of a nine hole pressure probe for measurement of flow with large angles are presented. The probe is calibrated at a velocity of 40 m/s in a yaw range of ±90° and a pitch range of -70° to 90° at intervals of 10°. The calibration space is divided into 9 zones, in each of which pressure from one of the nine holes is maximum. Calibration coefficients based on the pressures from this hole and other holes around this hole are defined in each of these zones. Additional data acquired during the calibration are used to validate the data reduction method. The errors in total and static pressures and flow velocity and angles are found to be small.

Keywords: Nine Hole Pressure Probe, Non-nulling Calibration, Large Angles, Zonal Method