3D LDA MEASUREMENTS IN A JET FLOW IMPINGING ON A TILTED FLAT PLATE

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ABSTRACT: Investigations [1-3] of flow fields generated by single or multiple jets impinging on a flat surface have been an area of interest in terms of understanding and improving the cooling of turbines blades. In this study, flow field near a flat plate formed by an oblique impinging turbulent jet has been investigated experimentally using a 3-D Laser Doppler Anemometry (LDA) system. Turbulent jet flow has been formed by issuing compressed air into ambient from a circular nozzle with an exit diameter *D* of 7.5 mm attached to a jet chamber whose pressure is controlled via an electronic pressure control system. High speed compressible or low speed incompressible jets can be generated by varying the chamber pressure. Distance between the jet exit and the flat plate can also be varied to study the effects of developing jet flows. Incidence of the impinging jet can be varied by changing the inclination of the flat plate. Fig.1 shows 3-D velocity vectors obtained by 3-D LDA system on a plane parallel to the flat plate which is tilted about 35 degrees with respect to the incoming jet flow and placed at about 45*D* from the jet exit. Jet flow axis is in the *x*-direction. Measurements were made about 1 cm away from the flat plate surface. Velocity vectors projected on a transverse *y-z* plane clearly indicate the stagnation point. Full paper will include volumetric (tomographical) velocity field information as well as turbulent characteristics at various jet exit velocities and flat plate incidence angles.

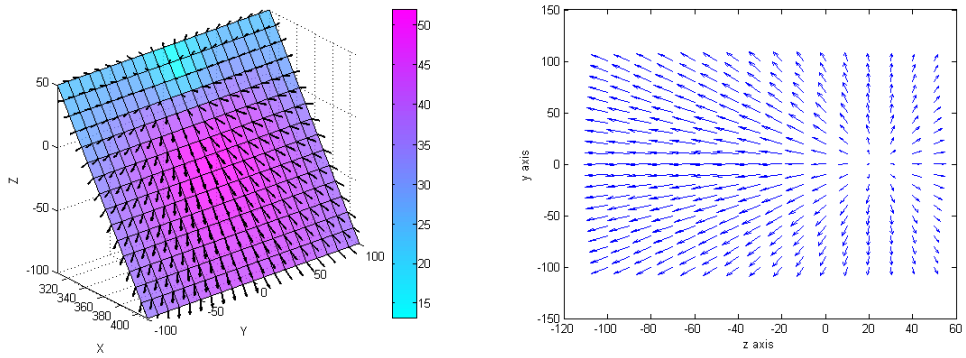

Fig. 1 Velocity vectors obtained by 3-D LDA system on a plane parallel to the flat plate which is placed at about 35 degrees to the incoming jet flow at 45D from the jet exit. Figure on the left shows the 3-D vectors within the range of 0-50 m/s whereas figure on the right shows the vectors projected on the measurement plane.

References

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