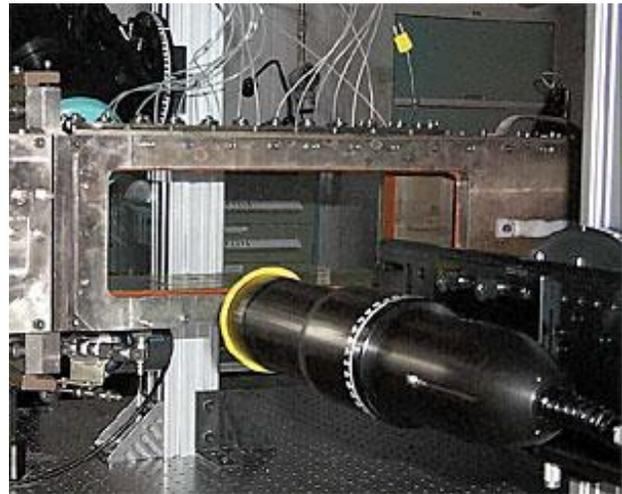


HIGH SPEED PARTICLE SIZE MEASUREMENTS

APPLICATION NOTE LDV-001

A state-of-the-art TSI PDPA/LDV system was used to characterize the flow and obtain particle size information in a supersonic flow. The supersonic wind tunnel had a cross section of 15 cm x 12 cm (W x H) and is equipped with a Mach 2 nozzle. An aerated-liquid jet was injected from the bottom of the wind tunnel into the high-speed cross-stream (air velocity of about 650 m/s).

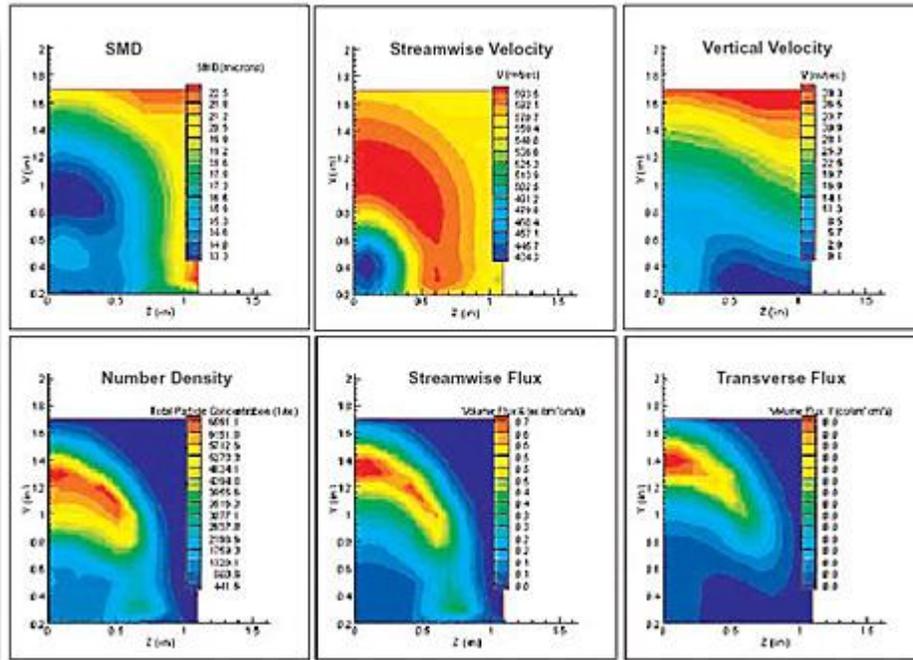
A two-channel PDPA system with an FSA 4000 signal processor was used in this experiment. Key processor features, including dynamic sampling-rate optimization, burst centering, SNR-based burst detection and intensity validation, enabled the PDPA system to make accurate, detailed measurements of particle size and velocity in this high-speed flow situation. A TSI TR260 transceiver probe and an RV2100 PDPA receiver probe measured particle size and velocity simultaneously.



TSI PDPA/LDV system making measurements in a supersonic wind tunnel (Courtesy: WPAFB)

The measurements were carried out in a cross-sectional plane 15 cm downstream from the injector exit. Results provided by the FLOWSIZER™ software are presented as contour plots. They show the variation, in the cross-sectional plane, of streamwise and vertical velocity components, Sauter Mean diameter (SMD), number density and flux. The cross-component of velocity is below 40 m/sec whereas the streamwise component reaches values up to 600m/sec. Droplet sizes (SMD values) are typically below 25 microns. The streamwise and transverse components of the flux vector are also shown.

Size and Velocity Measurements of a Water Spray in a M = 2 Cross-Flow



Reference

Lin, K.-C., Kennedy, P. J., and Jackson, T. A., "Structures of Water Jets in a Mach 1.94 Supersonic Crossflow," AIAA-2004-0971, January 2004.



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