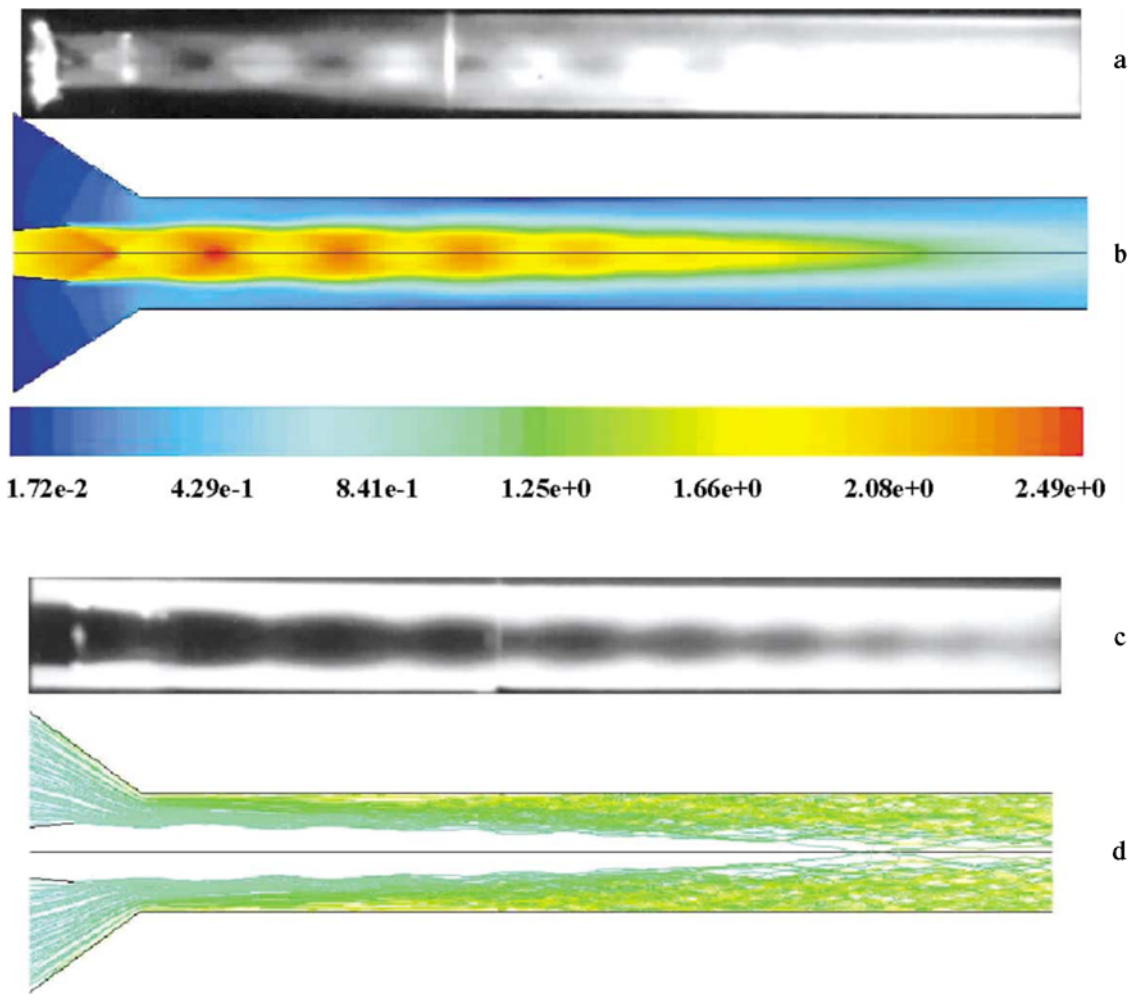
Journal of Visualization, Vol. 4, No. 4 (2001) 311

Numerical and Experimental Visualizations of the Flow Inside an Induced Air Ejector

Desevaux, P.[1] ***and Bailly, Y.***[1]

1) *CREST / UMR CNRS 6000 2, Avenue Jean Moulin F- 90 000 Belfort, France*



Laser tomography and numerical visualizations (CFD) were performed to study the interaction between the primary and secondary flows in a supersonic air ejector. The flow visualizations presented here are relative to the same operating conditions of the ejector (i.e. primary stagnation pressure of 5 bar and entrainment ratio of 0.43). The laser tomography shown on *image a* was achieved by illuminating the flow with a vertically polarized laser sheet. Tracers are sub-micronic water droplets (formed by condensation within the flow) which scatter in the Rayleigh regime. The shock structure which occurs in the supersonic jet downstream of a primary nozzle exit can be examined. The comparison with the iso-Mach number field achieved by CFD (*image b*) is in good accordance, especially for the shock cells locations. The visualization of the nonmixing zone can be obtained by illuminating the flow with a horizontally polarized laser sheet (to extinguish the Rayleigh scattering) and by adding Mie tracers (i.e. 1 μm oil droplets) in the secondary stream. The dark part of *image c* realized in these conditions corresponds to the primary jet portion which is not yet mixed with the secondary flow. A similar visualization of the nonmixing zone can be obtained numerically (*image d*) by plotting the trajectories of virtual particles dispersed in the secondary flow. These methods provide efficient tools for the optimized design of ejectors and mixers.