

Instantaneous Two-Dimensional Velocity Field Measurements in a Periodic Flame Using Particle Tracking Velocimetry

G. S. Lewis and B. J. Cantwell

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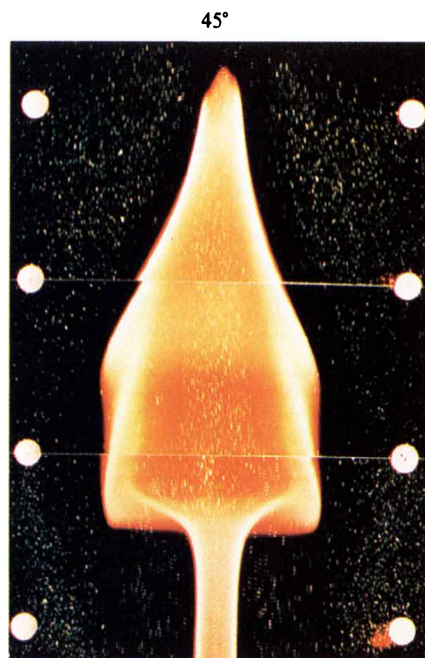


Figure 1(a)

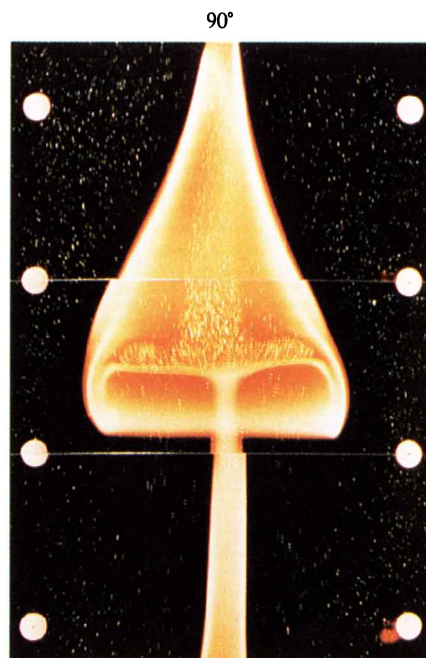


Figure 1(b)

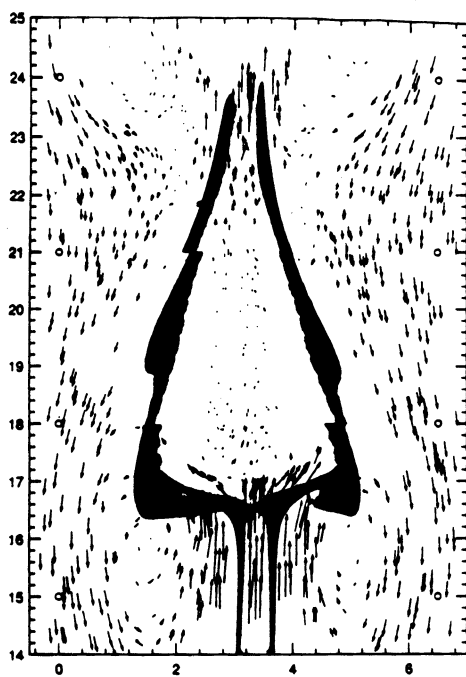


Figure 2(a)

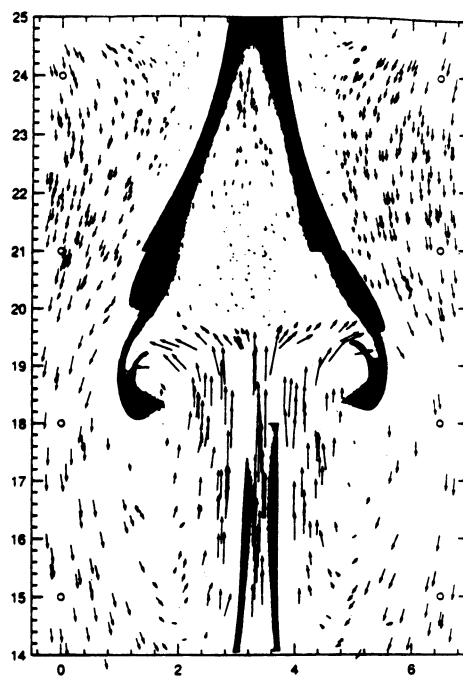


Figure 2(b)

INSTANTANEOUS TWO-DIMENSIONAL VELOCITY FIELD MEASUREMENTS IN A PERIODIC FLAME USING PARTICLE TRACKING VELOCIMETRY

G. S. Lewis and B. J. Cantwell
(Stanford University)

In the photographs presented here, $5\ \mu$ diam aluminum oxide particles are used to seed a coflowing jet diffusion flame. By multiply exposing a photograph of scattered light from small seed particles in the flow one is able to view the particle paths. Our implementation uses a pulsed 20 W copper vapor laser formed into a thin light sheet and directed along the diametric center of the jet. The laser repetition rate is 6 kHz. The scattered light is imaged using 35 mm black

and white or color photography taken at 90° to the laser sheet. The imaging parameters are set to capture three laser pulses in a photograph. The photographs are then digitized using a commercially available scanner to produce the corresponding bit mapped image. Figures 1(a) and 1(b) show the luminous image of the flame along with the seed particles. Figures 2(a) and 2(b) represent the corresponding velocity vector fields computed from the photographs. The vectors have been plotted in a moving frame of reference chosen to be the velocity of the flame structure. In this frame one can see a stagnant region inside the flame and a large vortex below and primarily outside the flame.

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