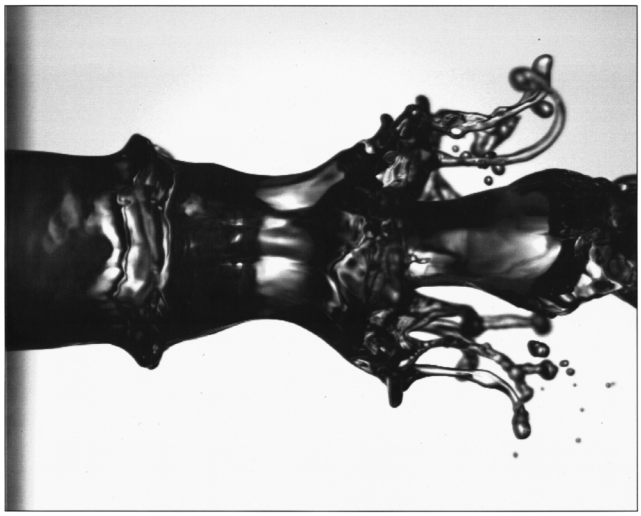

FIG. 1.

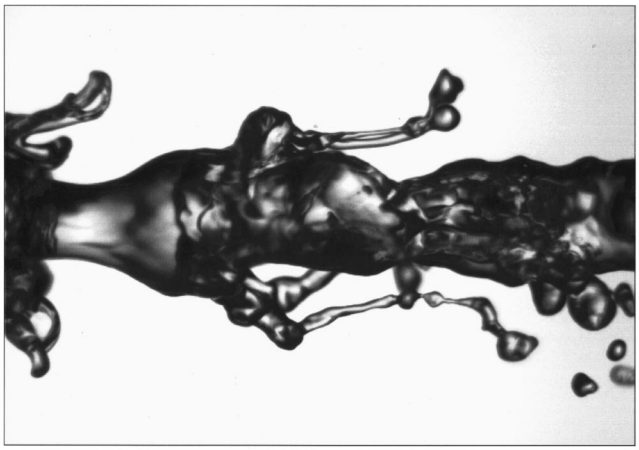

FIG. 2.

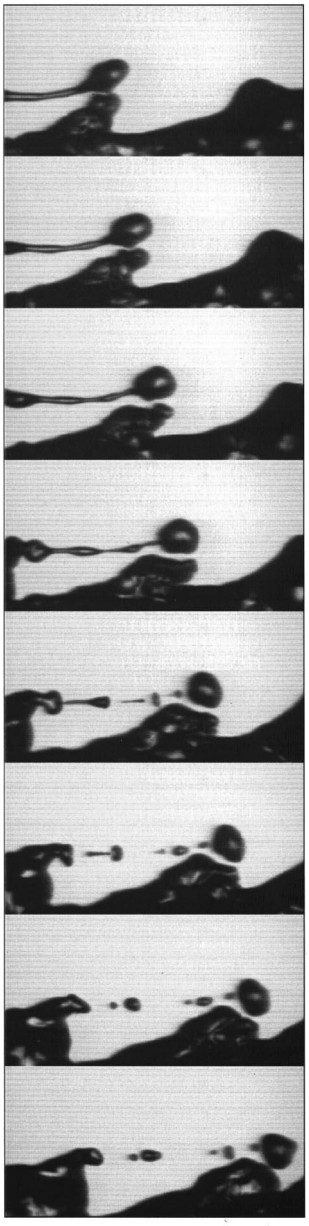

FIG. 3.

Ligament Mediated Drop Formation

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The atomization of a liquid jet by a fast coaxial gaseous stream involves the formation of ligaments which elongate in the rapid gas stream and eventually break into disjointed droplets.

A longitudinal shear instability first develops (Fig. 1), controlled by the initial gas shear layer thickness.[1] The passage of these waves confers to the liquid transient accelerations perpendicular to the interface which trigger a transverse instability of a Rayleigh–Taylor type from which ligaments form (Fig. 2).

After the breakup of each ligament (Fig. 3), the distribution of the drop sizes in the spray is a decaying exponential. The broad distribution of the ligament volumes and of the droplet sizes issued from each ligament is responsible for the broad statistics of the final spray distribution in this one-step, noncascading atomization process.

[1]E. Villermaux, ''Mixing and spray formation in coaxial jets,'' J. Prop. Power **14**, 807 (1998).