

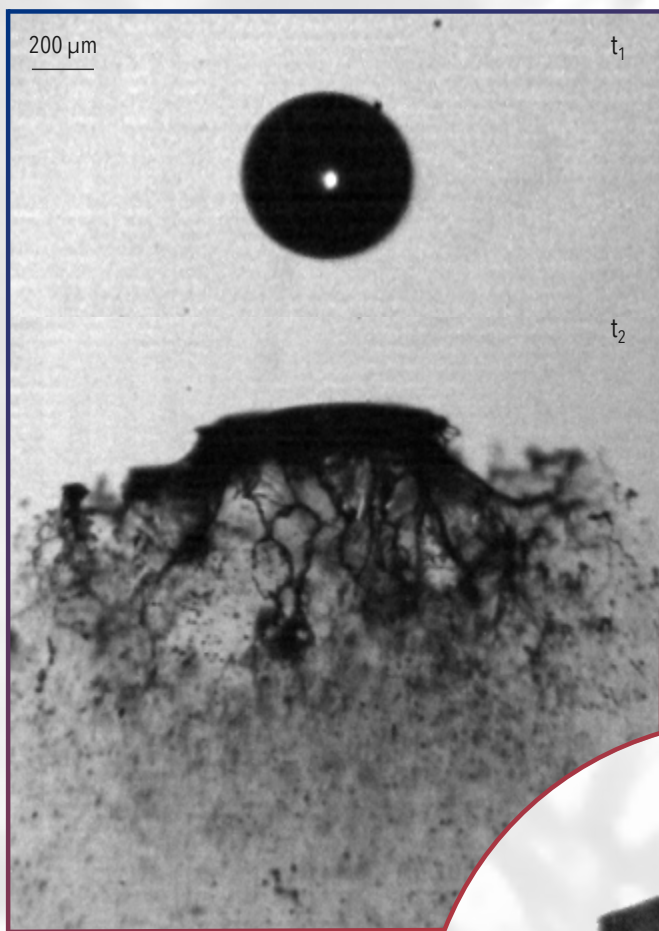


# Drop aerobreakup in high-speed gas flow



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Drop aerobreakup occurs when a liquid drop is exposed to aerodynamic forces induced by an incident gas flow. When the ratio of inertia to capillary forces exceed 100, direct observations of the mechanisms involved in a such process are extremely challenging due to the wide disparity in time and space scales. However, as

illustrated in this poster, when we succeed in capturing them, complex structures are revealed. The figures show selected sequential images of aerobreakup after a single water levitated drop of 560  $\mu\text{m}$  in diameter was struck by a planar shock wave. The shock wave direction is from the top down. The free-stream velocity is 150 m/s.

The residual liquid core of the initial drop evolves into a disc-like body shape about 80  $\mu\text{s}$  after the shock-drop interaction. At the drop edges, the development of an intricate ligament-branching structure consisted of threads and dendritic forms is observed.

Images recorded highlight two main processes responsible for such a structure: crests stretching and liquid film piercing. At later time, images captured show the formation of a water sheet in the shape of a bell. As illustrated, the sheet creases to form ribs. In advanced stages of the breakup process, water films between ribs are blown away, leaving only massive ligaments tied to the remaining core.

These observations were performed with high-magnification shadowgraphy using a long-range microscope mounted on a high-speed camera. A pulsed laser at high repetition rate was used to induce fluorescence and generate a speckle-free illumination source.

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