

Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Bouncing Jets NAVISH WADHWA, Department of Engineering Science and Mechanics, Virginia Tech, PAVLOS VLACHOS, Department of Mechanical Engineering, Virginia Tech, SUNGHWAN JUNG, Department of Engineering Science and Mechanics, Virginia Tech — Contrary to common intuition, free jets of fluid can “bounce” off each other on collision in mid-air, through the effect of a lubricating air film that separates the jets. We have developed a simple experimental setup to stably demonstrate and study the non-coalescence of jets on collision. We present the results of an experimental investigation of oblique collision between two silicone oil jets, supported by a simple analytical explanation. Our focus is on elucidating the role of various physical forces at play such as viscous stresses, capillary force and inertia. A parametric study conducted by varying the nozzle diameter, jet velocity, angle of inclination and fluid viscosity reveals the scaling laws for the quantities involved such as contact time. We observed a transition from bouncing to coalescence with an increase in jet velocity and inclination angle. We propose that a balance between the contact time of jets and the time required for drainage of the trapped air film can provide a criterion for transition from non-coalescence to coalescence.

Navish Wadhwa
Department of Engineering Science and Mechanics, Virginia Tech

Date submitted: 10 Aug 2011

Electronic form version 1.4