TUAT Fluid Dynamics Seminar

Large droplet formation and deep-pool impact

Lecturer:

Prof. **Tadd Truscott**

Date: Monday, 6th February, 2023

Time: 12:00 - 13:00

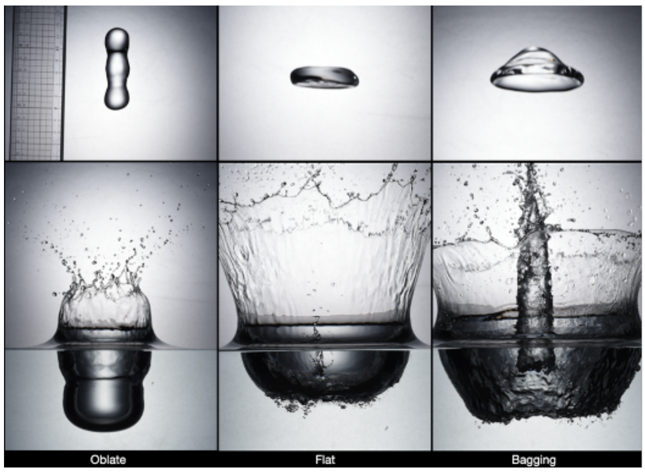
Place: Building 6 - Room201

Biography

Tadd Truscott is a professor of Mechanical Engineering at KAUST. Professor Truscott's current research interests are in fluid dynamics, novel imaging, and experimental methods. By merging different areas of research, he works on problems such as three-dimensional flow-field dynamics of rising and falling objects in the water, acceleration-induced cavitation, the transport of water through desert plants, and the collective behavior of pelotons and fish. Tadd received his B.S. in mechanical engineering from the University of Utah, and then attended the Massachusetts Institute of Technology for his Ph.D.09' in Ocean and Mechanical Engineering. He is currently an associate professor at King Abdullah University of Science and Technology.

Abstract

Water droplet break-up has been studied extensively but typically focuses on droplets with radii near the capillary length (< 3 mm). Droplets larger than this typically break up when their velocity approaches terminal velocity, with larger droplets breaking up well before they reach terminal speeds. In general, studies involving large droplet break-ups are scarce and part of the reason is the difficulty of performing such experiments. We propose a method to suspend droplets of radii up to 60 mm using a series of release mechanisms and release speeds to illustrate the complexity and parameter space for practical solutions to these problems. The research details the effects of release acceleration, surface geometry, and surface features on the initial droplet perturbations. The shape of a droplet impact onto a liquid pool may greatly influence the dynamics of the cavity formation and splashing. Although droplet impact onto a liquid pool has been investigated for relatively small droplets, behaviors greatly change when the droplet is large enough that significant oscillation deformation occurs. The shape and dynamics of the cavity formed by the large droplets are significantly affected by the deformation of the droplet at impact. In general, three different shapes of the impacting droplets occur prolate, oblate, and circular. We show that, for a fixed liquid volume and a fixed Weber number of an impacting droplet, prolate-shaped droplets produce the maximum cavity depth whereas an oblate-shaped droplet results in a minimum cavity depth.



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