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The Effect of Surfactants on the Breakup of an Axisymmetric Laminar Jet JUSTIN WALKER, RICHARD CALABRESE, University of Maryland — The breakup of a laminar axisymmetric jet is a well-studied fluid dynamics phenomenon, first studied by Savart (1833) and Rayleigh (1879). Many papers have been published over the years describing the theory of jet breakup, such as the paper by Tomotika (1935). More recently, many studies have been performed using various computational simulations to better understand the mechanics of jet breakup, notable among these are Homma et al. (2006). Despite the extensive literature on the topic, the impact of surface active agents on jet breakup has received limited attention, whether due to the system's inherent complexity or a poor understanding of the mechanics of the action of surface active agents themselves. In this study, the drop size distribution and jet breakup length resulting from the breakup of liquid jet systems were studied experimentally. Jets were formed by forcing a fluid through a narrow capillary using pneumatic pressure. Experiments involving oil-water jets with aqueous surfactants were performed. Several distinct regimes were identified based on hydrodynamic and physicochemical conditions. Jet length was found to increase with surfactant concentration, while droplet diameter was found to decrease (dependent on jet regime). A Semiempirical model to predict the breakup length of Jets in the presence of surfactants is also proposed.

Justin Walker
University of Maryland

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