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On Breakup Regime Transitions of Liquid Jets in Crossflow[1]
KHALED SALLAM, CHEE-LOON NG, RAMPRAKASH SANKARAKRISHNAN, Oklahoma State University — An experimental and computational research is performed to study the breakup regime transitions of round liquid jets in uniform gaseous crossflow at normal temperature and pressure, large liquid/gas density ratios and small Ohnesorge numbers. Pulsed photography, shadowgraphy, and high-speed imaging were used to observe jet primary breakup regimes. The computational study analyzed the internal and external flow fields within the column, bag, and shear breakup regimes. Present results show that the column waves along the liquid jet are attributed to Rayleigh-Taylor instabilities. In bag breakup, the lower pressure along the sides of the jet pulled the liquid away from both the upwind and downwind surfaces of the liquid cross-section. In shear breakup, the flattened upwind surface pushed the liquid towards the two sides of the jet. The breakup of turbulent liquid jets was influenced by a new dimensionless number in terms of liquid/gas momentum ratio and the jet Weber number.

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