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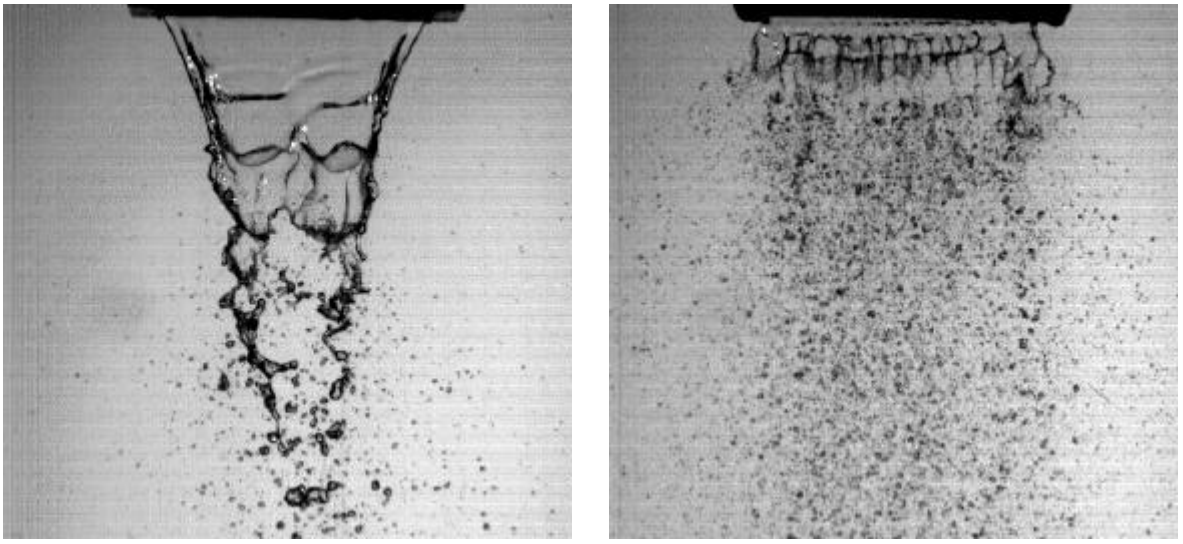
TOWARDS CONTROLLED LIQUID ATOMIZATION

E.C. Fernandes, M.V. Heitor and V. Sivadas

Center for Innovation Technology and Policy Research
Laboratory of Thermo-fluids, Combustion and Environmental Systems
Instituto Superior Técnico
Technical University of Lisbon
Av.Rovisco Pais 1049-001 Lisbon, Portugal
http://in3.dem.ist.utl.pt/

Abstract

The present study discusses controlling mechanisms of air-blast atomization and the prospect of external triggering for enhancing atomization quality of a planar liquid sheet. The investigation builds on previous experimental evidence provided by flow visualization of 2-D liquid sheets formed between two co-flowing air streams at variable velocities, and is particularly aimed to improve our understanding on air-blast atomization for lean combustion and low-emission engines. The study is extended by varying the sheet thickness and through the detailed analysis of physical processes occurring at the liquid-gas interface, namely the liquid surface wave growth characteristics due to viscous shear. The results show that the influence of waves on liquid sheet break-up is confined only to a thin region near the interface, and thus require properly tuned, and externally-controlled, excitations for effective atomization.



(a) (b)

Figure 1 Air-blast atomization of a planar liquid film

[liquid velocity = 1.3 m/s; film thickness = 0.4 mm; (a) air velocity = 10 m/s (b) air velocity = 20 m/s]