Universität Stuttgart
INSTITUT FÜR THERMODYNAMIK DER LUFT- UND RAUMFAHRT
Direktor: Professor Dr.-Ing. B. Weigand
Pfaffenwaldring 31, 70569 Stuttgart, Germany · http://www.itlr.uni-stuttgart.de

Thesis (Bachelor or Master)

Experimental Investigation of Impact Morphologies during an Oblique Droplet Impact onto a Thin Wall Film

Spray impacts are part of many technical and environmental applications, such as the distribution of plant protection agents, coating processes, medical sprays or soil erosion. A spray consists of many droplets, which impact with different trajectories, thus impact angles, on dry solid walls but also on walls covered with liquid films of different thicknesses. Therefore, a single droplet impact onto a wall film of the same liquid can be regarded as an elementary process in such a spray.
Recently, the oblique impact of a single droplet onto a thin film was investigated experimentally with a synchronized two-perspective high-speed camera setup at the ITLR. The impact velocity and impact angle were varied and different crown morphologies and splashing characteristics were observed and summarized in a regime map. This study was conducted with isopropanol as a fluid for droplet and wall film.
Within this thesis similar experiments are to be conducted with water, which has a significant higher surface tension and lower viscosity. Again, the impact velocity has to be varied within the splashing regime (generation of secondary droplets during the impact). For a Bachelor's thesis, the impact angle is held constant, while for a Master's thesis, the impact angle has to be varied as well. The goal is to characterize different crown morphologies and to define the range of impact conditions under which they occur. Additionally, the influence of the fluid properties should be described by comparing it to previous experiments with isopropanol.

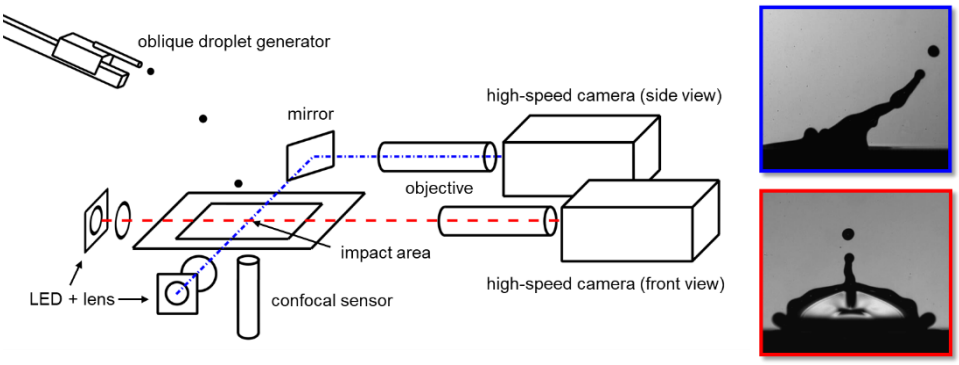

Figure 1: Shematic representation of the experimental setup.

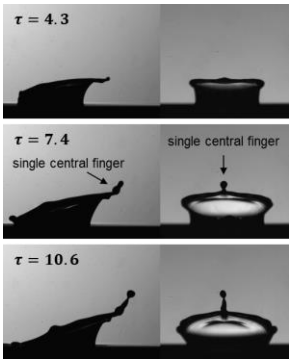

Figure 2: Two-perspective shadowgraphy images of the crown morphology.

Tasks:

- read into theoretical background (droplet impact morphology dependent on fluid properties)
- tuning of droplet generator and learn experimental procedure
- conduct experiments within the splashing regime
- investigate and classify impact morphologies
- compare to results with a similar study conducted with isopropanol
- evaluation, documentation, and presentation of the results

Start Date: As soon as possible
Facility and Duration: The thesis will be conducted at the Institute of Aerospace Thermodynamics (ITLR) in Stuttgart within 4 months (Bachelor) or 6 months (Master)

Advisors:

- Jonathan Stober, M.Sc., Room 1.143; Tel: 0711 685 62042;
  jonathan.stober@itlr.uni-stuttgart.de
- Dr.-Ing. Kathrin Schulte, ITLR