INJECTION CHARACTERISTICS ON THE SURFACE OF A LIQUID JET IN A WIND TUNNEL

R. Branam*, M. Hammou, A. Volpp, W. Mayer
wolfgang.mayer@dlr.de
German Aerospace Center, DLR Lampoldshausen, D-74239 Hardthausen, Germany
***Guest Scientist from the U.S. Air Force Research Laboratory**

This fundamental investigation takes a look at the break-up of a round liquid jet a various injection conditions. To adjust the relative velocity between the liquid jet and the gaseous ambient a wind tunnel like coaxial flow configuration has been used. This made it possible to distinguish between effects of aerodynamic forces, chamber pressure, jet velocity, and turbulence. Using shadowgraphy and a novel image processing approach, wavelengths and amplitudes have been measured providing quantitative information about injection [1]. The absolute injection velocity of the jet seems to affect the structures the most with an increasing velocity causing the wavelengths to be smaller. An increase in chamber pressure seems to have little influence on the jet with no relative velocity between the gas and liquid jet, but reduces the jet velocity value at which droplets will be formed indicating that aerodynamic forces play the dominant role in the break-up process. The amplitude provides much information about the likelihood of drop formation. Turbulence destabilizes the surface and defines the initial amplitude and wavelength spectrum.

[1] R. Branam, J. Telaar, G. Schneider, W. Mayer, Injection characteristics on the surface of a coaxial jet, AIAA Paper 2002-3695, Joint Propulsion Conference, Indianapolis, IN, July, 2002