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Undergraduate Laboratory on a Turbulent Impinging Jet ARNAUD IVANOSKY, ETIENNE BREZZARD, French Military Academy of Saint-Cyr, BRET VAN POPPEL, MICHAEL BENSON, US Military Academy — An undergraduate thermal sciences laboratory exercise that includes both experimental fluid mechanics and heat transfer measurements of an impinging jet is presented. The flow field is measured using magnetic resonance velocimetry (MRV) of a water flow, while IR thermography is used in the heat transfer testing. Flow Reynolds numbers for both the heat transfer and fluid mechanics tests range from 20,000-50,000 based on the jet diameter for a fully turbulent flow condition, with target surface temperatures in the heat transfer test reaching a maximum of approximately 50 Kelvin. The heat transfer target surface is subject to a measured uniform Joule heat flux, a well-defined boundary condition that allows comparison to existing correlations. The MRV generates a 3-component 3-dimensional data set, while the IR thermography provides a 2-dimensional heat transfer coefficient (or Nusselt number) map. These data sets can be post-processed and compared to existing correlations to verify data quality, and the sets can be juxtaposed to understand how flow features drive heat transfer. The laboratory setup, data acquisition, and analysis procedures are described for the laboratory experience, which can be incorporated as fluid mechanics, experimental methods, and heat transfer courses

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