Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Parametric Study of Hot Surface Ignition of an Impinging Fuel Spray Using Large-Eddy Simulation**[1] DANYAL MOHADDES, MATTHIAS IHME, Stanford Univ — The impingement of a fuel spray on a hot surface is of relevance in fuel-injection systems and for industrial safety. The interaction of a spray with a hot surface may result in the formation of a thin fuel film or the rebounding of impinging droplets. The nature of this interaction is determined by the properties of the phases involved, most importantly by the temperature of the impinged surface and the Weber number of the impinging spray. For sufficiently high surface temperatures, the Leidenfrost effect inhibits direct liquid-solid contact. In all cases, the high temperature of the surface results in evaporation of the fuel spray, and may lead to ignition. In this study, the sensitivity of impinging spray ignition to surface temperature is studied using large-eddy simulations. An impinging n-dodecane spray at ambient pressure is modeled using an Eulerian-Lagrangian formulation, with chemical source terms modeled using finite-rate chemistry. The effect of surface temperature on ignition and subsequent flame propagation is shown, and the effect of fuel film formation is considered parametrically to demonstrate its effect on near-wall composition and chemistry.

[1]Financial support from The Boeing Company under grant number 134708 [IC2017-2182] and the Natural Sciences and Engineering Research Council of Canada [PGSD2-532767-2019] is gratefully acknowledged. This research used resources of the National Energy Research Scientific Computing Center (NERSC), a U.S. Department of Energy Office of Science User Facility.

Danyal Mohaddes
Stanford Univ

Date submitted: 10 Aug 2020 Electronic form version 1.4