On the Spatial Optimization of Electrohydrodynamic Propulsion Methods

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Paper Abstract

Previous work has shown electrohydrodynamic (EHD) propulsion methods to be a potential alternative to conventional means of aircraft propulsion. This technology emits no greenhouse gasses, is quieter than conventional propulsion methods, and has been shown to have a similar thrust to power ratio. However, spatial demands limit the widespread adoption of EHD thrusters. In this paper, we address the spatial optimization of single stage EHD thrusters consisting of two wire-to-cylinder electrode pairs. We confirm the existence of an optimal electrode pair spacing for this thruster geometry. Previous efforts by Gilmore and Barrett (MIT) have estimated a maximum thrust per unit area of $3.3Nm^{-1}$. We extend their work by deriving and calculating the optimal electrode pair spacing with respect to the inter-electrode distance d. The findings presented in this paper will enable the construction of more spatially efficient EHD thrusters, allowing this technology to become a viable option for an increased number of applications.