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Water-based Electric Propulsion for Small Spacecraft[1] JOHN SLOUGH, University of Washington, JUSTIN LITTLE, ANTHONY PANCOTTI, MSNW LLC, JORDAN NEUHOFF, University of Washington, AEROSPACE PROPULSION GROUP COLLABORATION — In-space micropropulsion systems must strike a balance between simplicity, performance and mass/volume requirements, while having the flexibility of working with high-density propellants, and compatibility with the onboard power source. The Inductive Coupled Electromagnetic (ICE) thruster has the potential to achieve the highest level performance in all of these criteria, making it ideal for small satellite station-keeping and de-orbit maneuvers. The plasma generation is achieved with a small ($\sim$4 cm diameter), spiral cut, porous stainless steel antenna with an integrated RF oscillator. The ICE thruster positions the coil driver, as well as all other circuit elements, immersed in the liquid propellant providing for a PPU energy transfer efficiency of near unity. The use of a porous material as the interface between the driver coil and plasma generation zone at the thruster exit eliminates the need for a complex, miniature high pressure gas feed and valve system. A number of ICE developmental milestones have been achieved. Preliminary work has characterized the influence of the coil injector porosity on the mass flow rate of liquid water into the plasma generation zone. The device has been operated on a thrust stand, and preliminary results will be discussed. Work is now underway to transform the present form of the ICE to a proto-flight thruster.

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