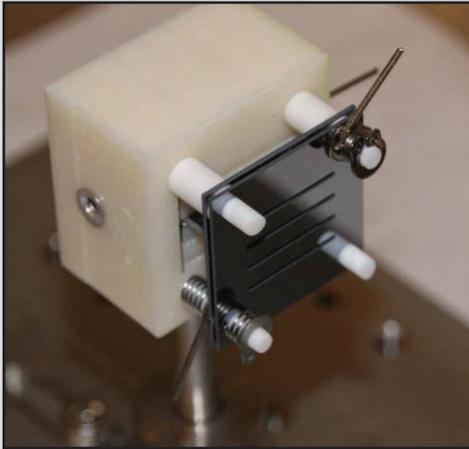


## Mini-Thrusters No Small Achievement in Satellite Propulsion



*Pictured is a miniature electro-spray thruster prototype developed by Massachusetts Institute of Technology (MIT) researchers via AFRL funding. The mini-thruster, complete with its four rows of ion emitters, is contained within two black plates, each measuring about 1 sq in. (Credit: Dr. Paulo Lozano, MIT)*

Based on the in-progress development of miniature electric propulsion systems, or mini-thrusters, small satellites—including CubeSats, the Air Force's latest—may soon perform space maneuvers with greater ease and undertake increasingly formidable tasks, such as searching for planets beyond earth's solar system. Dr. Paulo Lozano, an AFRL-funded researcher at the Massachusetts Institute of Technology, leads a team of scientists whose investigations are giving due consideration to the advantages of electric propulsion over more traditional, chemical rocketry. Consequently, their notable research results include the discovery of ionic liquid ion sources (ILIS), the core elements of mini-thruster technology.

Of particular interest to Dr. Lozano's team are those properties of the mini-thruster technology that could ultimately foster advances both in spacecraft travel between different orbits and in spacecraft self-destruction upon controlled reentry (a

preventative measure in terms of mitigating the creation of additional space debris). In addition to these and other anticipated benefits proffered to small satellites, ILIS-based mini-thrusters may also find applicability in areas such as semiconductor etching; the inherent capacity of the fast-moving ions to create nanoscale patterns could facilitate their use in fabricating computer chips or similarly sized mechanical devices.

Dr. Lozano predicts that his team will have a mini-thruster prototype developed in approximately 4 or 5 months and, further, expects the technology to become a reality in the next 2 years. Upon completion of the prototype, the researchers will proceed with plans to measure ion velocity and energy in order to determine engine thrust and efficiency. Subsequent to these investigations, they will begin preliminary efforts to integrate mini-thrusters with flight hardware.