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MICROGRAVITY TESTING OF A NEWLY DEVELOPED AIR-BREATHING ELECTROSTATIC THRUSTER

Abstract

Ionic propulsion systems have been utilized in deep-space exploration missions for decades due to their high fuel and energy efficiency. More recently, however, a variation of this thruster has been developed, which does not require consumable propellants and instead ionizes the air flowing around it. This paper investigates the testing of a new concept of air-breathing electrostatic thruster in a microgravity environment. The thruster is based on a two-stage configuration with a positive copper wire grid as an emitter and a neutral aluminum plate as a collector. The use of copper wires as an emitter, as opposed to the use of needles, resulted in a significant reduction of corona discharge and, hence, a decrease in ozone generation. The distance between each stage was defined according to ground testing performance. The developed thruster is tested within a parabolic flight operated by the National Research Council (NRC). The executed parabolas were utilized to investigate the thruster performance in a microgravity environment. The thruster-produced accelerations are analyzed and compared with the performance of other developed electric thrusters.