

66th International Astronautical Congress 2015

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

Author: Prof. Michael Keidar
George Washington University, United States, keidar@gwu.edu

MICRO-CATHODE ARC THRUSTER FOR SMALL SATELLITE PROPULSION

Abstract

The George Washington University (GWU) has developed a CubeSat-class thruster called the Micro-Cathode Arc Thruster (CAT). The CAT is a high Isp (2000-3500s), solid metal fueled, low average power (≈ 0.1 W when operating) micro-thruster of small cross section (5 mm), with a mass of less than 200g, and no pressurant tanks. Electric current forms a plasma discharge between a concentric cathode-anode configuration. Thrust is produced through arc discharge, eroding some of the cathode material in uniform manner, to exit at high velocity, during which it is accelerated out the nozzle by a Lorentz force. Thrust can be controlled by varying the frequency of pulses, with a demonstrated range to date of 1-50 Hz, (1 N - 0.05 mN). The CAT design achieves uniform electrode erosion, and has demonstrated over two months of continuous operation during trials. The system operates at low voltage, accepting unregulated DC power from the spacecraft bus. The corresponding exhaust plume is 99