

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

Author: Mr. ALEKSANDR BOGATYY

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
boga-alex@yandex.ru

Mr. Ruslan Akhmetzhanov

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
ahmetzhanov1991@mail.ru

Dr. Grigoriy Dyakonov

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
riame3@sokol.ru

Prof. Vladimir Kim

RIAME, Russian Federation, riame4@sokol.ru

Mrs. Natalia Lyubinskaya

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
riame3@sokol.ru

Prof. Garri A. Popov

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
riame@sokol.ru

Mr. Sergey Semenikhin

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
riame3@mail.ru

Mr. Denis Merkurev

Research Institute of Applied Mechanics and Electrodynamics (RIAME), MAI, Russian Federation,
merckuriev.denis@yandex.ru

Dr. Vladimir Obukhov

RIAME, Russian Federation, riame@sokol.ru

Mr. Aleksey Derkachev

KBKhA, Russian Federation, abel-cadb@yandex.ru

DEVELOPMENT OF ELECTRIC PROPULSION THRUSTERS FOR SMALL SPACECRAFT AT
RIAME MAI**Abstract**

The Research Institute of Applied Mechanics and Electrodynamics of the Moscow Aviation Institute (RIAME MAI) is deeply involved in the development of low-power electric propulsion thrusters to be used as a part of the motion control system of small spacecraft. A line of thrusters with the power ranging from several watts up to some hundreds of watts is developed on the basis of ablative pulsed plasma thrusters (APPT), thus enabling coverage for a wide range of small spacecraft with the mass from 10 kg up to several hundreds of kg. With a view to ensuring active life of a small spacecraft of about 5 years and longer at the available power from some watts to 200 W, it is proposed to use the APPT-based electric propulsion system (EPS), while ion thrusters (IT) and stationary plasma thrusters (SPT) are proposed for the power of over 200 W. Electric propulsion systems based on APPT with the power of up to 100

We have unquestionable advantage over propulsion systems of other types: lower mass, design simplicity, high failure tolerance, long lifetime, high reliability, and lower prime cost. Independence of the APPT performance characteristics (except thrust) on the power consumption is its significant feature. EPS on the basis of IT with the power consumption of 200 W and higher is characterized by high thrust efficiency and long lifetime. This enables their application not for the orbit correction only, but for solving cruise problems also. The SPT-based EPS with the relatively low power consumption (of about 200 W) has low thrust cost, enabling its application on board the low-orbit spacecraft. Comparing to IT, thrusters of such type have more simple design and higher manufacturability. Vast experience in the SPT industrial production is accumulated in Russia.