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**MECHANISM OF PROPULSION SYSTEM FOR SMALL SATELLITES BY USING  
MICROTHRUSTERS POWERED BY SINGLE-ION NANO-HEAT ENGINES.****Abstract**

In order to meet growing global requirement of affordable missions beyond low Earth Orbit, the small satellites can accomplish the missions which are not possible by larger satellites. But, these small satellites lack effective propulsion system, and once in space are usually left to passively spin in orbits close to Earth. After a mission concludes, the satellite burns up in the lower atmosphere. Analysis has proved mission feasibility, identifying key challenges for effective techniques for satellite propulsion, Navigation, Autonomous Operations and independent surveying. A flat, compact square, much like a computer chip, covered with 500 microscopic tips that, when stimulated with voltage, emit tiny beams of ions. Together, an array of these tips creates a small puff of charged particles that can help propel a small-sized satellite forward. They are so small that one can put several thrusters on a vehicle. A small satellite outfitted with these microthrusters could not only move to change its orbit, but do other maneuvers. Envisioning a small satellite with several microthrusters, these satellites can possibly be oriented in different directions. When the satellite needs to propel out of orbit, onboard power source would temporarily activate the thrusters. Microthrusters may even be used to power much larger satellites. Flat panels lined with multiple thrusters could propel a satellite through space, switching directions much like a rudder. A typical heat engine that turns heat into a usable source of energy operates at about 25% efficiency and this new nano-heat engine, operating off of a single ion of calcium, is projected to be extremely more efficient. Second law of thermodynamics determines the efficiency of heat powered engines powered by thermal heat reservoirs. This means that the efficiency of such engines is limited, its maximum efficiency is known as the Carnot Limit. However, it is proposed that the nano-heat engine is immune to the second thermodynamic law because the heat baths and the possibilities of non-equilibrium states can be explored and manipulated. In this paper, we propose a hybrid mechanism of satellite propulsion by unification of these two technologies, Microthruster and Nano-heat Engine.

keywords: lower Earth Orbit, Carnot limit, nano-heat engine, microthrusters