PURDUE INNOVATES | Office of Technology Commercialization

Microelectronic Thermal Valve

A low-mass, low-power, self-contained attitude adjustment system utilizes waste heat to provide precise, micronewton-level thrust for picosatellites without moving parts.

Attitude adjustment for picosatellites (picosats) with low mass only necessitate a thrust force in micronewtons; however, common technology in industry is too bulky or does not allow for fine thrust control. The environment of operation limits the ability of refinement due to precise volumes of liquid or gas delivery in pressures existing in low gravity. Power limitations, which are apparent in any environment, require more stringent criteria for the design of new aeronautics technology.

Researchers at Purdue University have developed a low-mass, low-power, self-contained attitude adjustment system that operates using the waste heat of the vehicle and produces fine thrust forces through the delivery of low volumes of gas and/or liquids. Through localized heating of the propulsion media and balancing of pressures created by the vehicle under normal operation, this technology can deliver lower, more specific quantities of thrust force than currently available technology.

Advantages:

-Low-mass/low-power

-No moving parts

-Utilizes waste heat to operate

Potential Applications:

-Propulsion/thrust

-Attitude adjustment

TRL: 5

Intellectual Property:

Technology ID
2016-ALEX-67273

Category
Aerospace & Defense/Hypersonics & Propulsion Systems
Aerospace & Defense/Thermal Management & Combustion Optimization

Authors
Alina Alexeenko-Peroulis
Anthony George Cofer
Stephen Heister

Further information
Aaron Taggart
adtaggart@prf.org

View online

Provisional-Patent, 2015-12-06, United States | Utility Patent, 2016-12-06, United States | CON-Patent, 2021-05-03, United States | DIV-Patent, 2023-12-20, United States | Utility Patent, N/A, United States

Keywords: Picosatellite attitude adjustment, low-mass propulsion, low-power thrust, self-contained adjustment system, waste heat propulsion, micronewton thrust force, fine thrust control, miniature satellite propulsion, thermal propulsion system, no moving parts thruster