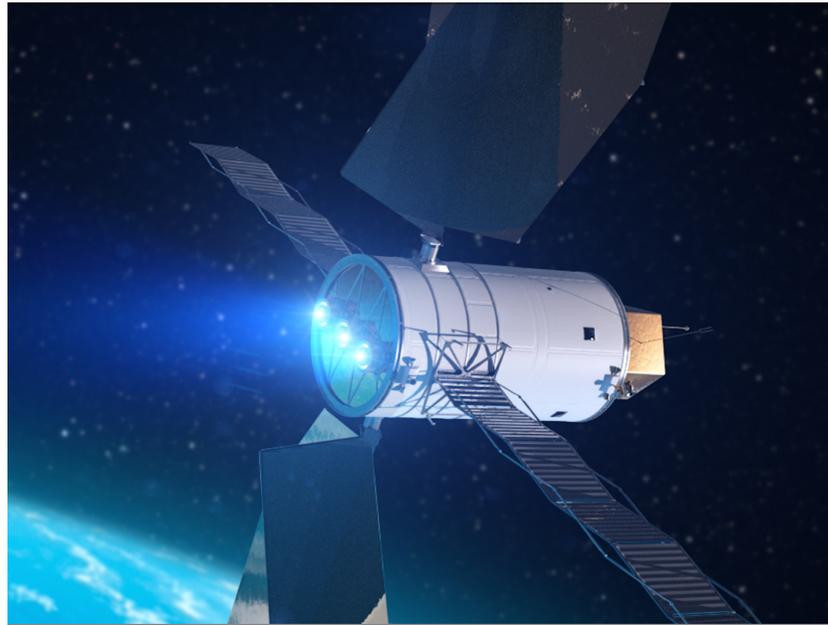




## TECHNOLOGY SOLUTION

### Propulsion



# Small Spacecraft Electric Propulsion (SSEP) Technology Suite

## Low-Power High-Propellant Throughput SSEP

The NASA Glenn Research Center (GRC) has expertise in small spacecraft electric propulsion (SSEP). NASA's SSEP project is developing technologies critical to expanding spacecraft capabilities and enabling ambitious new missions into deep space. Advanced SSEP technologies are based on the use of exceptionally fuel-efficient electrostatic Hall effect thrusters with optimized magnetic shielding. Low-power, high-throughput SSEP dramatically increases the capabilities of small spacecraft, and advanced magnetic circuit designs result in game-changing thruster performance. These advances can maximize reliability while minimizing launch cost.

Innovators at GRC have developed a suite of SSEP technologies. GRC seeks commercial partners to help satisfy NASA exploration and science mission requirements while improving U.S. competitiveness in the global electric propulsion market and catalyzing innovation related to SSEP technology.

### BENEFITS

- Source of electric propulsion technology for small spacecraft: technologies related to low-power, high-propellant throughput Hall effect thrusters are available at no cost to U.S. companies
- High fuel economy: NASA's SSEP technology suite reduces the amount of propellant required onboard for deep space missions by up to 90% compared to chemical systems
- Reduced cost: allows deep space missions to carry more cargo and/or use smaller launch vehicles to reduce cost

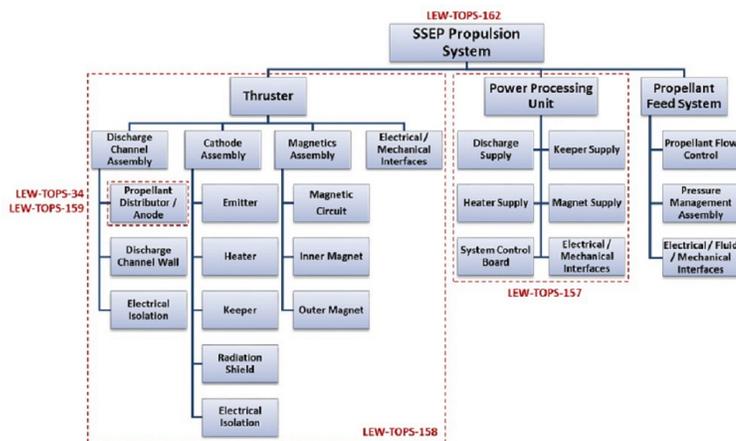


## THE TECHNOLOGY

Innovators at GRC have developed a suite of SSEP technologies for small, low-power spacecraft using Hall effect thrusters including a high propellant throughput small spacecraft electric propulsion thruster (LEW-TOPS-158), a power processing unit for SSEP (LEW-TOPS-157), an anode manifold plug for Hall effect thrusters (LEW-TOPS-159), and additional Hall effect technologies (LEW-TOPS-34). See the Additional Information section at the bottom of the page for more information on each technology suite component.

GRC is making these technologies available to U.S. companies through a no-cost\*, non-exclusive license agreement and companion Space Act Agreement. Licensees may receive a comprehensive package of design and process documents including issued and pending patents, design drawings, materials specifications, and test data. Licensees will assist in defining system requirements and creating new platforms to use the SSEP technologies. This streamlined, collaborative commercialization strategy helps satisfy NASA exploration and science mission requirements while improving U.S. competitiveness in the global electric propulsion market and improving the success of new electric propulsion developments. Working alongside our licensees, GRC hopes to generate a compendium of SSEP knowledge as a living document, maintained by all users in a consortia-like environment.

\*Although the license and Space Act Agreement are no cost to the licensees, licensees would be responsible for setting up and maintaining an EAR restricted file sharing space.



A systems-level overview of NASA's small spacecraft electric propulsion (SSEP) technology

More Information

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NP-2020-03-2831-HQ

## APPLICATIONS

The technology has several potential applications:

- Aerospace: a propulsion system for small spacecraft using Hall effect thrusters
- Commercial space: small satellite constellations, station keeping, orbit raising, spacecraft servicing, missions beyond Low Earth Orbit/ Geosynchronous Equatorial Orbit

## PUBLICATIONS

Patent No: 7,624,566; 10,273,944; 11,815,074; 11,540,381

Patent Pending

LEW-TOPS-157: Power Processing Unit (PPU) for Small Spacecraft Electric Propulsion

LEW-TOPS-158: High Propellant Throughput Small Spacecraft Electric Propulsion Thruster

LEW-TOPS-159: Anode Manifold Plug for Hall Effect Thrusters

LEW-TOPS-34: Hall Effect Thruster Technologies

Development of a High-Propellant Throughput Small Spacecraft Electric Propulsion System to Enable Lower Cost NASA Science Missions, Benavides, Gabriel F., et al, August 19, 2019 <https://ntrs.nasa.gov/citations/20190030739>

[technology.nasa.gov](https://technology.nasa.gov)

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LEW-17678-1, LEW-19121-1, LEW-19121-2, LEW-19799-1, LEW-20035-1, LEW-20041-1, LEW-TOPS-162