Green Liquid Monopropellant Thruster

For in-space propulsion in challenging environmental conditions

Physical Sciences, Inc. (PSI), and Orbital Technologies Corporation (ORBITEC) are developing a unique chemical propulsion system for next-generation NASA science spacecraft and missions. The system is compact, lightweight, and can operate with high reliability over extended periods of time and under a wide range of thermal environments. The system uses a new storable, low-toxicity liquid monopropellant as its working fluid. In Phase I, the team demonstrated experimentally the critical ignition and combustion processes for the propellant and used the data to develop thruster design concepts.

In Phase II, the team developed and demonstrated in the laboratory a proof-of-concept prototype thruster. A Phase III project is envisioned to develop a full-scale protoflight propulsion system applicable to a class of NASA missions.

Applications

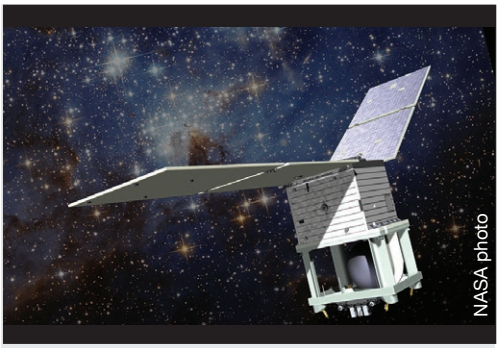
NASA

This technology is ideal for propulsion systems in challenging environmental conditions, with long operational life, and with high duty cycles:

- Missions to other planets, their moons, and other small bodies:
  - Sampling their atmospheres
  - Descent and landing on their surfaces
  - Returning soil samples from their surfaces in ascent modules
  - Rendezvous and docking with orbiting mother ships
- Missions to the Earth's Moon, Venus, Mars and its moons, the moons of Jupiter, and asteroids

Military

- Air Force:
  - Liquid thrusters for in-space propulsion
- National Reconnaissance Organization:
  - Fast-response, long-life maneuvering propulsion systems
- Army:
  - Green monopropellant–based, high-pressure gas generators for pressurizing gelled propellants
- Other Department of Defense:
  - Liquid engines for propelling highly maneuverable, throttleable tactical missiles



Phase II Objectives

- Demonstrate operation of a prototype liquid monopropellant thruster incorporating the new fast-response, high-reliability, and long-life ignition system
- Develop ignition system designs to optimize performance
- Develop a modular, small-scale test thruster incorporating the ignition system to allow rapid changeability of components representative of different ignition/combustor designs
- Characterize the operation and performance of the small-scale thruster to demonstrate propulsive performance and ignition system start/stop/restart
- Develop functional prototype of a large-scale thruster and demonstrate its operation
- Develop complete propulsion system design incorporating the proposed in-space thruster technology

Benefits

- Compact and lightweight
- Can operate reliably over extended periods of time and under a wide range of thermal environments

Firm Contact

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