



## NASA SBIR 2009 Phase I Solicitation

### S3.04 Propulsion Systems

Lead Center: GRC

Participating Center(s): JPL

The Science Mission Directorate (SMD) needs spacecraft with more demanding propulsive performance and flexibility for more ambitious missions requiring high duty cycles, more challenging environmental conditions, and extended operation. Planetary spacecraft need the ability to rendezvous with, orbit, and conduct in situ exploration of planets, moons, and other small bodies in the solar system ([http://www.nap.edu/catalog.php?record\\_id=10432](http://www.nap.edu/catalog.php?record_id=10432)). Future spacecraft and constellations of spacecraft will have high-precision propulsion requirements, usually in volume- and power-limited envelopes.

This subtopic seeks innovations to meet SMD propulsion requirements, which are reflected in the goals of NASA's In-Space Propulsion Technology program to reduce the travel time, mass, and cost of SMD spacecraft. Advancements in chemical and electric propulsion systems related to sample return missions to Mars, small bodies (like asteroids, comets, and Near-Earth Objects), outer planet moons, and Venus are desired. Additional electric propulsion technology innovations are also sought to enable low cost systems for Discovery class missions, and eventually to enable radioisotope electric propulsion (REP) type missions.

The focus of this solicitation is for next generation propulsion systems and components, including high-pressure chemical rocket technologies and low cost/low mass electric propulsion technologies. Specific sample return propulsion technologies of interest include higher pressure chemical propulsion system components, lightweight propulsion components, and Earth-return vehicle propulsion systems. Propulsion technologies related specifically to planetary ascent vehicles will be sought under S3.08 Planetary Ascent Vehicle.

Chemical systems for sample return missions should focus on component technologies for high-pressure (>700 psi) chemical systems such as:

- Lightweight tanks;
- Actuators and regulators;

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- Self pressurizing propellants.

This subtopic also seeks proposals that explore uses of technologies that will provide superior performance in electric propulsion systems. These technologies include:

- Hall thruster power processing unit (PPU) capable of 3  $\hat{A}$ ½ kW, 5A, and 700 V with a maximum mass of 5.25 kg;
- High specific impulse/low mass electric propulsion systems for sample return missions;
- Future low cost/low mass electric propulsion systems;
- Thrusters should provide thrust up to 20 mN with a specific impulse between 1600 to 3500 seconds;
- Corresponding power processing units capable up to 1 kW of input power;
- The total system mass should not exceed 3 kgs (roughly 1 kg for a thruster and 2 kg for a PPU).

Proposals should show an understanding of one or more relevant science needs, and present a feasible plan to fully develop a technology and infuse it into a NASA program.