Innovations in propulsion technologies are needed to support the Science Mission Directorate (SMD) goals of better understanding the Earth-Sun system, exploring our solar system, and investigating the nature of the universe beyond our solar system. Planetary spacecraft need ever-increasing propulsive performance and flexibility for ambitious missions requiring high-duty cycles and years of operation. Satellites and satellite constellations have high-precision propulsion requirements, usually in volume- and power-limited envelopes. Propulsion systems must avoid contamination of instruments from thruster plumes. This subtopic seeks innovations in propulsion technologies to increase the capabilities of SMD spacecraft. Specifically, technology innovations are sought in the areas of solar electric propulsion, monopropellant technology, and miniature/precision propulsion.

Solar Electric Propulsion

Technology advancements are needed to improve the capability of low- to medium-power electric propulsion systems, including ion, Hall, and advanced plasma thrusters. Areas where innovations are sought include power processing, long-life, high-efficiency cathodes and neutralizers, electrodeless plasma production, low-erosion materials for ion optics and Hall discharge chambers, high-temperature magnetic circuits, and next-generation thrusters. Innovations sought include, but are not limited to, those that improve performance, increase lifetime, reduce mass, and decrease cost. Improvements are also sought for propellant management system components including storage, distribution, and flow control to support solar electric propulsion applications.

Monopropellant Technology

Advancements are sought for propulsion systems using advanced monopropellants. Spacecraft using high-performance (Isp >275 s), high-density (>1 g/cc) monopropellant formulations will need high-durability catalyst materials or, alternatively, non-catalytic ignition technology for power-limited spacecraft. Critical component materials (e.g., tank bladders, valve seats, and filters) that are compatible with advanced monopropellants need to be developed. Performance and density improvements are sought for applications with very low propulsion requirements.

Miniature/Precision Propulsion
Propulsion technologies for miniature (less than 10 kg) spacecraft and for high-precision (impulse bit