NASA SBIR 2017 Phase I Solicitation

Z8.01 Small Spacecraft Propulsion Systems

Lead Center: GRC

Participating Center(s): GSFC, JPL, MSFC

Technology Area: TA2 In-Space Propulsion Technologies

There are currently a wide range of technologies for propulsion systems, however the miniaturization of these systems for small spacecraft is a particular challenge. While cold gas or pulsed plasma systems are targeted for small delta-v, ?v application, modules that can provide more demanding maneuvers still need development. Small spacecraft buses other than cubesats have more flexibility to accommodate systems with several thruster units to provide more attitude control and also large single axis maneuvers. Missions have demonstrated these technologies successfully and performance data gathered has paved the way for future modifications of the existing hardware in order to re-adapt the designs to satisfy demanding constraints.

Specifically, proposals are solicited in the following areas:

- High Impulse per unit volume (>2000 Ns/U):
  - Example applications: Interplanetary/Deep space, orbit capture.
  - Electric Propulsion with thrust greater than 1.25 mN.
  - Long life Chemical Propulsion.
  - High thrust/power ratio.
  - Delta-v > 1 km/sec.
  - Includes ACS functionality
- High Thrust per unit volume (>750 Ns/U):
  - Example applications: Orbit raising (MEO, GEO), long life LEO.
  - Electric Propulsion with thrust greater than 1.25 mN.
  - Chemical Propulsion thrust > 100 mN.
  - Includes ACS functionality.
  - Low soakback temps, (i.e., minimal increase to local bus temperature).
- Precision Control (I-bit < 0.2 microN-sec) for spacecraft < 180 kg:
  - Example applications: Formation flying, tight pointing requirements.
  - Sub-microN thrust levels.

Proposers are expected to quantify improvements over relevant SOA technologies that will substantiate the investments in the new technology. Key metrics for that comparison can include, but is not limited to, recurring cost, total impulse, thrust, life, sail characteristic acceleration, etc. Potential opportunities for mission infusion for both technology demonstration and long-term mission application should be identified along with potential technology gaps that need to be addressed or assessed.

For concept/component development, proposals are solicited to mature propulsion concepts of TRL 2 or higher and

mature them to TRL 6 at the component level. For system level maturation, proposals are solicited to mature integrated system solutions capable of delivering potential qualification or flight hardware within the constraints of a Phase II SBIR with no or minimal need for enhancements or Phase III investments.

The desired features for a SmallSat propulsion system is one that balances reliability, high performance (i.e., relatively high specific impulse [Isp] and thrust), has no/minimal chemical or electromagnetic contamination issues, is low pressure (or pressurizes post deployment), safely contains propellant (hazardous or non-hazardous), low cost, and has the simplest design feasible in order to meet performance requirements.