NASA SBIR 2004 Phase I Solicitation

S1.04 Spacecraft Technology for Micro- and Nanosats

Lead Center: GSFC

NASA seeks research and development of components, subsystems and systems that enable inexpensive, highly capable small spacecraft for future SEC missions. The proposed technology must be compatible with spacecraft somewhere within the micro-to-nano range of 100 kg down to 1 kg. All proposed technology must have a potential for providing a function at current performance levels with significantly reduced mass, power, and cost, or have a potential for significant increase in performance without additional mass, power, and cost. These reduction and/or improvement factors should be significant and show a minimum factor of 2 with a goal of 10 or higher.

A proposed technology must state the type or types of expected improvements, (performance, mass, power, and cost), list the assumptions for the current state-of-the-art, and indicate the spacecraft range of sizes for which the technology is applicable.

The integration of multiple components into functional units and subsystems is desirable but not a requirement for consideration.

- Avionics and architectures that support command and data handling functions, including input and output, formatting, encoding, processing, storage, and analog-to-digital conversion. System level architecture, software operating systems, low voltage logic switching, radiation-tolerant design, and packaging techniques are also appropriate technologies for consideration.
- Sensors and actuators that support guidance, navigation, and control functions such as Sun sensors, star trackers, inertial reference units, navigation receivers, magnetometers, reaction wheels, magnetic torquers, and attitude thrusters. Technologies with applications to either spinning or three-axis stable spacecraft are sought.
- Power system elements including those that support the generation, storage, conversion, distribution regulation isolation, and switching functions for spacecraft power. System level architecture, low voltage buss design, radiation tolerant design, and novel packaging techniques are appropriate technologies for consideration.
- New and novel application of technologies for manufacturing, integration and test of micro and nano size spacecraft are sought. Limited production runs of up to several hundred spacecraft can be considered. Efficiencies can derive from increased reliability, flexibility in the end-to-end production process, as well as cost, labor, and schedule.
- Technologies that support passive and active thermal control suitable for micro and nano size spacecraft are sought. These functions include heat generation, storage, rejection, transport, and the control of these functions. Efficient system level approaches for integrated small spacecraft that may see a wide range of
thermal environments are desirable. These environments may range from low heliocentric orbits to 2 hr shadows.

- Elements that support Earth-to-space or space-to-space communications functions are sought. This includes receivers, transmitters, transceivers, transponders, antennas, RF amplifiers, and switches. S and X are the target communications bands.

- System architectures and hardware that lead to greater spacecraft and constellation autonomy and, therefore, reduce operational expenses are desired. Technologies that derive added capability for a fixed bandwidth, efficient utilization of ground systems, status analysis, and situation control or other enhancing performance for operations are sought.

- Structure and mechanism technologies and material applications that support the micro and nano class of spacecraft are desired. Exoskeleton structures, spin release mechanisms, and bi-stable deployment mechanisms are typical of the desired technology.

- Propulsion system elements that provide delta-V capability for spinning and/or three-axis stable spacecraft are sought. This includes solid, cold-gas, and liquid systems, and their components such as igniters, thrust vector control mechanisms, tanks, valves, nozzles, and system control functions.