



NASA SBIR 2011 Phase I Solicitation

S4 Low-Cost Small Spacecraft and Technologies

Low-Cost Small Spacecraft and Technologies This subtopic is targeted at the development of technologies and systems that can enable the realization of small spacecraft science missions. While small spacecraft have the benefit of reduced launch costs by virtue of their lower mass, they may be currently limited in performance and their capacity to provide on-orbit resources to payload and instrument systems. With the incorporation of smaller bus technologies, launch costs, as well as total life cycle costs, can continue to be reduced, while still achieving and expanding NASA's mission objectives. The Low-Cost Small Spacecraft and Technologies category is focused on the identification and development of specific key spacecraft technologies primarily in the areas of integrated avionics, attitude determination and control including de-orbit technologies, and spacecraft power generation and management. The primary thrust of this topic is directed at reducing the footprint and resources that these bus subsystems require (size, weight, and power), allowing more of these critical resources to be shifted to payload and instrument systems, and to further reduce the overall launch mass and volume requirements for small spacecraft. Note that related topics of interest to S4 Low-cost Small Spacecraft and Technologies may be found in other areas of the solicitation: S3.01 Command, Data Handling and Electronics; S3.03 Power Generation and Conversion; and S3.05 Power Management and Storage. 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. Research should be conducted to demonstrate technical feasibility during Phase I and show a path toward a Phase II hardware and/or software demonstration, and when possible, deliver a demonstration unit or software package for NASA testing at the completion of the Phase II contract.

Subtopics

S4.01 Unique Mission Architectures Using Small Spacecraft

Lead Center: ARC

Advancements in space technologies can now enable discussions on how small spacecraft might be used to assemble or form large space structures, which are significantly more capable than the individual spacecraft unit, while exploiting the advantages of small spacecraft such as low unit and launch costs.

This subtopic solicits technologies that include the integration of critical subsystems required to allow small spacecraft to work collaboratively to create sparse arrays, large-scale or synthetic apertures, distributed sensors or clusters of sensors, and robotic technologies which could be used in space to perform novel missions using multiple spacecraft in a coordinated fashion. These technologies could include, but are not limited to: high precision

timing systems combined with high precision attitude determination and control systems, satellite-to-satellite communications technologies, autonomous systems, and small, efficient in-space propulsion technologies.

Proposers are asked to build a conceptual system/spacecraft design/operational scenario that details the architecture, components and specifications, as well as existing technology gaps necessary to replace the function of a single large spacecraft with an alternative that uses small spacecraft. Supporting analysis including cost and feasibility should be included. Phase II contract efforts should be used to simulate and prototype to the extent possible the system or further reaching subsystems detailed in Phase I.

For small spacecraft planetary missions, planetary protection requirements vary by planetary destination, and additional backward contamination requirements apply to hardware with the potential to return to Earth (e.g., as part of a sample return mission). Technologies intended for use at/around Mars, Europa (Jupiter), and Enceladus (Saturn) must be developed so as to ensure compliance with relevant planetary protection requirements. Constraints could include surface cleaning with alcohol or water, and/or sterilization treatments such as dry heat (approved specification in NPR 8020.12; exposure of hours at 115C or higher, non-functioning); penetrating radiation (requirements not yet established); or vapor-phase hydrogen peroxide (specification pending).