NASA S4.03 Low-Cost, Rapid Spacecraft Design and Multi-Subsystem Functionality

Lead Center: ARC

To achieve low-cost small spacecraft missions, the resources necessary for the conceptual and detailed design of the spacecraft should be proportional to other phases of the successful project. Novel approaches are encouraged to re-use development from other projects and design current projects with the foresight to be reused for future flight projects. The Low-Cost, Rapid Spacecraft Design and Multi-Subsystem Functionality subtopic encourages offerors to utilize open source software and hardware solutions to be utilized for other actors, including entrepreneurial and university teams, for reusability.

This subtopic is seeking proposals in the following, but not limited, areas:

- Methods and tools to enable a geographically distributed, concurrent design of system concepts and functions.
- Dynamic, open source, on-line database and collection system of COTS components and subsystems suitable for spacecraft - a database of components open to the public, can be used for conceptual design and to determine an accurate Master Equipment List (MEL), cost, and schedule based on the current market value and lead time for the components; a prospective model. Such a database should include an API where companies can:
  - Plug into a design tool, whether open source or proprietary, to utilize the database for a prospective model;
  - Link to their components already publicized on their own webpage to collect the data on one centralized location;
  - Utilize database to extend options from a proprietary database of components or designs.
- Modular and scalable subsystem design of spacecraft.
- Consolidation of spacecraft functions to reduce mass, power, volume and interfaces (i.e., multi-functionality) - integrating the functions of two or more onboard disciplines such as structure/mechanical,
power, avionics, telecommunications, propulsion, thermal control and attitude control and determination. Also consider cross-functional spacecraft-to-payload capabilities in the areas of attitude determination, navigation, telecommunications and other mission level functions.

- Internal wireless data and command communications systems that alleviate need for wire harness.

Phase 1 - Research should demonstrate the technical feasibility and show a path towards a hardware/software demonstration. Plan a demonstration to validate the technologies/tools/processes. Bench or lab-level demonstrations showing concept viability is encouraged. Commercial applicability should be addressed.

Phase 2 - Emphasis should be placed on developing and demonstrating the technology under relevant test conditions. Additionally, a path should be outlined that shows how the technology could be commercialized or further developed into space-worthy systems. When applicable, researchers should deliver a demonstration unit for functional and environmental testing at the completion of the Phase 2 contract.