NASA SBIR 2018 Phase I Solicitation

Z4.02 In-Space Sub-Modular Assembly

Lead Center: LaRC

Participating Center(s): GSFC, JSC, MSFC

Technology Area: TA12 Materials, Structures, Mechanical Systems and Manufacturing

NASA envisions that persistent (very long duration) assets in space will require modular assembly architectures and interfaces to facilitate routine expansion, upgrade and refurbishment at the module and submodule level. Â This subtopic seeks novel approaches to two classes of module interface systems.Â

First, autonomous (and highly automated) approaches and hardware concepts that support the interconnection of modules in the 100 â€“ 5,000 kg range using some form of space robotics.Â (Note: The robotic manipulation systems are not the subject of this solicitation.) Â The objective of this first subtopic area is to minimize the parasitic mass from the joints and modularity features that are required for inter-module assembly. Â The lightweight connections between modules must include both electrical (power and data) and structural connections. Â Joining strategies that support fluid connections are of interest but not necessary to be responsive to this subtopic area.Â The structural connection should occur at a minimum of 3 discrete locations fixing the rigid body motion of the 2 modules in all 6 degrees of freedom while isolating (minimizing) forces resulting from thermal induced strain between the modules consistent with a LEO orbit.Â The three (or more) connections do not have to occur simultaneously.Â

The second assembly need is the development of a lightweight modular, palletizing system to support transport, emplacement and exchange of sub-modules in the 1-100 kg range. Â The palletizing system must support power and structural connections between the pallet and supporting backbone structure (fluid connections are a plus).Â Important considerations for the system are structurally efficient approaches that minimize parasitic mass, volume and power necessary to operate the palletizing system while minimizing forces resulting from temperature induced strain consistent with a LEO orbit.