Precision Deployable Lightweight Cryogenic Structures for Large Space Telescopes

Lead Center: JPL

Participating Center(s): MSFC

Planned future NASA Origins Missions and Vision Missions such as the Single Aperture Far-IR (SAFIR) telescope, Life Finder, and Submillimeter Probe of the Evolution of Cosmic Structure (SPECS), require 10-30 m class telescopes that are diffraction limited at wavelengths between the visible and the near IR, and operate at temperatures from 4-300 K. The desired areal density is 3-10 kg/m². Wavefront control may be either passive (via a high stiffness system) or active control. Potential architecture implementations must package into an existing launch volume, deploy and be self-aligning to the micron level. The environment is expected to be L2.

This topic solicits proposals to develop enabling component and subsystem technology for these telescopes in the areas of precision deployable structures, i.e., large deployable optics manufacture and test; innovative concepts for packaging integrated actuation systems; metrology systems for direct measurement of the structure; deployment packaging and mechanisms; active control implemented on the structure (downstream corrective and adaptive optics are not included in this topic area); actuator systems for alignment (2 cm stroke actuators, lightweight, submicron dynamic range, nanometer stability); mechanical and inflatable deployable technologies; new thermally-stable materials for deployables; new approaches for achieving packagable structural depth; etc.

The goal for this effort is to mature technologies that can be used to fabricate 20 m class, lightweight, cryogenic flight-qualified telescope primary mirror systems. Proposals to fabricate demonstration components and subsystems with direct scalability to flight systems (concept described in the proposal) will be given preference. The target volume and disturbances, along with the estimate of system performance, should be included in the discussion. A successful proposal shows a path toward a Phase 2 delivery of demonstration hardware on the scale of 3 m for characterization.