T5.05-2204 - Solar Sail Tubular Mast

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NON-PROPRIETARY DATA

IDENTIFICATION AND SIGNIFICANCE OF INNOVATION

SSTM draws from Opterus' rich history of engineering ingenuity and sets a new standard for scalable and efficient space technologies. Through the SSTM, Opterus is equipped to transform large-scale sail systems, for enhanced mission profiles and extended space exploration capabilities. SSTM enables the next generation of large class solar sails for multiple heliophysics missions. SSTM is a lower risk solution because the simplified design minimizes the risk of malfunctions during deployment, ensuring a higher degree of mission success and reliability. The SSTM's inherently stable truss design eliminates the need for other complex stabilization methods and mechanisms, streamlining the deployment process and substantially reducing associated costs. The inherent cost-saving and risk-reducing attributes of an SSTM based system make it both a mass efficient and financially efficient innovation, furthering Opterus' commitment to enabling space missions through advanced engineering solutions.

TECHNICAL OBJECTIVES AND PROPOSED DELIVERABLES

Technical objectives for the Phase II will build off of the accomplishments of the completed Phase I. The program had many successes in analysis, boom rolling and structural tests demonstrating high structural mass efficiency. The boom design achieved in Phase 1 exceeds current system load requirements and has a mass of 88 grams per meter (gpm). For Phase II, we will employ mass optimization algorithms in combination with the analysis process to drive boom mass down into the 50 gpm range.

Additional objectives include further development of system level structural models demonstrating the use of SSTM in practical solar sail architectures and tailoring recirculating belt deployer technologies for solar sail systems up to 10,000 sqm, though a smaller 2000 sqm class sail will be the priority for the Phase II effort. The program will consist of an iteration of analysis, design, build, and test tasks. Fabrication and testing of is an important part of the proposed work and Opterus will demonstrate a 30 meter boom as well as methods for testing and characterization of that boom.

While the boom design, analysis and testing cycle for a solar cruiser scale system is the primary priority, other priorities include further development of Opterus' recirculating belt deployer, integrated deployer system level design, thermal system considerations, and scalability to larger solar sail systems.

TRL

Estimated

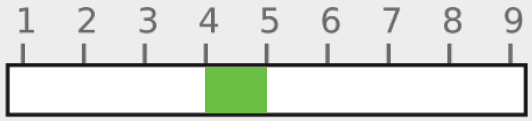


IMAGE TITLE: PH I SSTM Prototype



NASA APPLICATIONS

Possible NASA mission infusion includes Solar Cruiser, High Inclination Solar Mission, and Solar Polar Imager. Each NASA solar sail mission concepts require 30m rollable boom systems. The closed cross section SSTM provides higher structural performance than open boom variants or bi-stable closed cross section booms which enable Solar Cruiser and the larger 10,000sqm solar sail mission concepts. The fundamental technology is also readily applied to high power solar arrays required for SEP and moon to mars objectives.

NON-NASA APPLICATIONS

Non-NASA applications include high power solar arrays, tensioned planar arrays, and other large area deployable space structures that required large aperture areas and low mass structures. High power solar arrays are a key market fit and the company is developing space solar power beaming structures concepts using similar boom technologies with defense customers.

FIRM CONTACTS

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