Optimization of the Roll-Out Solar Array (ROSA) and Mega-ROSA

High-efficiency photovoltaic power production

The Mega-ROSA is a new, highly modularized, and extremely scalable self-deployed solar array that provides immense power level range capability, from 100 kilowatts to several megawatts. Mega-ROSA, an enhancement of NASA's ROSA, will enable extremely high power spacecraft and solar electric propulsion powered missions, including space tug and large-scale planetary science and lunar/asteroid exploration missions. Mega-ROSA/ROSA is adaptable to all photovoltaic and concentrator flexible blanket technologies.

This Phase II project optimized the Mega-ROSA/ROSA technology and deployable structural system. More specifically, the project optimized the elastically deployable slit-tube thin-shell boom structures through advanced composites design, development and analytical modeling, materials design and development, innovative and affordable manufacturing processes, and the development of accurate engineering methodologies to rapidly allow for new material properties and design performance characterizations. The team developed new and innovative structural sections/configurations, such as section closeout and root reinforcement. Finally, the team developed and refined innovative and affordable composite structure fabrication processes.

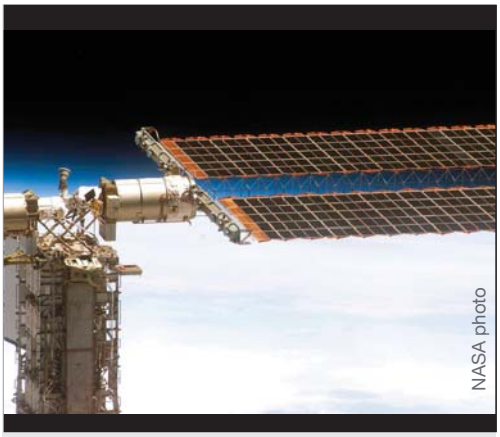
Applications

NASA

- Solar electric propulsion:
  - Appropriate for NASA missions that require high-efficiency photovoltaic power production through deployment of an ultralightweight and highly modular structural system

Commercial

- Solar electric propulsion
- Low Earth orbit (LEO) surveillance, reconnaissance, communications, commercial mapping, and other critical payload/equipment satellites
- Medium Earth orbit (MEO) satellites and space tugs
- Geosynchronous orbit (GEO) communications and critical payload/equipment satellites
- Fixed-ground and deployable/retractable mobile ground-based systems


NASA photo

Phase II Objectives

- Optimize Mega-ROSA/ROSA solar array materials and structures
- Characterize creep/relaxation phenomena
- Perform analytical modeling
- Optimize the array's manufacturing process

Benefits

- Inexpensive
- Ultralightweight
- Compact stowage volume (< 50 kW/m^3 for very large arrays)
- High strength and stiffness
- Capable of providing power levels from 60 kW to more than 300 kW
- Operates in high-voltage and high- or low-temperature environments
- Radiation tolerant
- Scalable

Firm Contact

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