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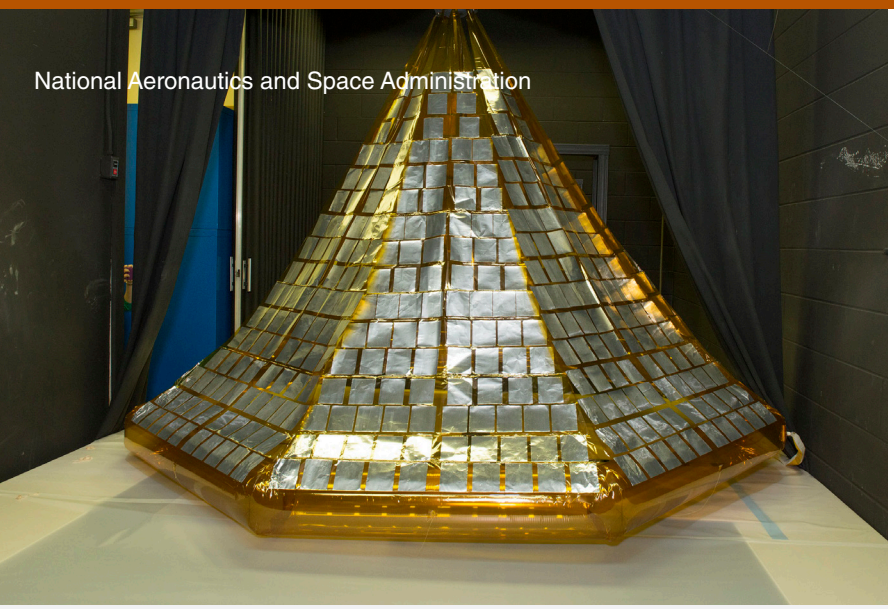


Power Generation and Storage

Lightweight Solar Power for Small Satellites

Provides more than two times the power density (W/m^3) of current power systems

NASA Marshall Space Flight Center is developing a lightweight space-based solar power array that offers a high-power-to-stowed volume and weight ratio. The system provides power to small satellites and CubeSats that are "power starved," i.e., those operating on extremely limited power because of the size limitations for housing onboard power sources. Simplicity and packaged power density set NASA's new solar unit apart from its competition. Small satellites cannot take advantage of deployable high-efficiency solar cell arrays due to their complexity and mechanical needs: the weight and volume requirements exceed what is available in small satellites and CubeSats. The new system, however, is compact enough to provide a 3U CubeSat with ~200 Watts, for example, or a 6U with 500 Watts of power. NASA is developing the technology and is looking for partners to license and commercialize it.

BENEFITS

- **High packing efficiency** — more than two times the W/m3 of current systems
- **Lightweight, highly efficient power —** fold and stow form enables packing a 20-200W system on a CubeSat
- **Simplified and rugged design —** works in any orientation (no pointing hardware needed)
- **Reduced cost —** brings costs down by leveraging recent advances in thin film cells:

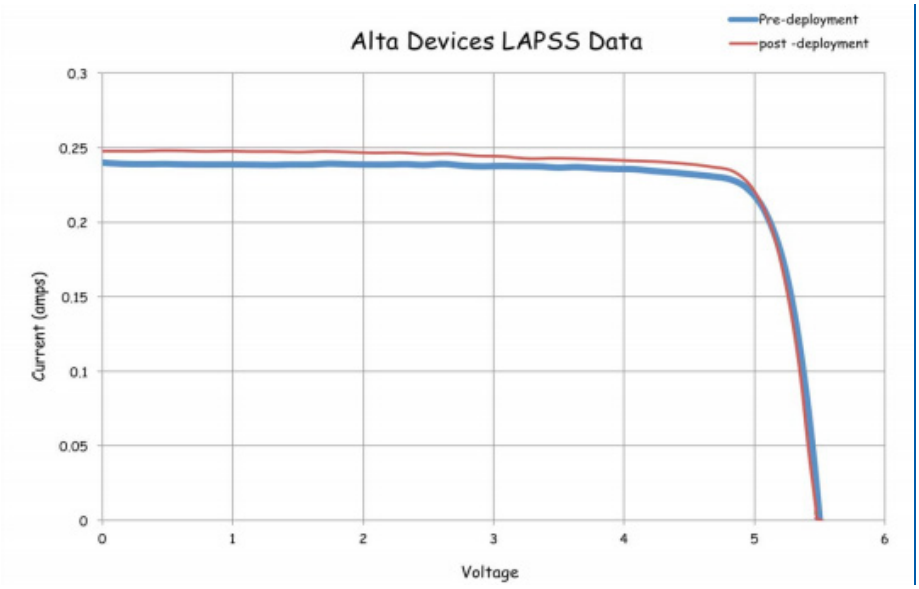
  -Conversion efficiencies >20%
  -Areal mass density reduced to <250g/m2

technology solution

THE TECHNOLOGY

The innovation targets small satellites or CubeSats for which conventional deployable arrays are not feasible due to their size, weight and complexity. This novel solar cell array includes a thin and flexible photovoltaic cell applied to an inflatable structure to create a high surface area array for collecting solar energy in a lightweight, simple and deployable structure. The inflatable array, with its high functional surface area, eliminates the need and the mechanisms required to point the system toward the sun. The power density achievable in these small arrays is similar to that of conventional high-power deployable/pointable arrays used on large satellites or space vehicles.

Although inflatable solar arrays have been previously considered by others, the arrays involved the use of traditional rigid solar cells. Researchers are currently working with thin film photovoltaics from various suppliers so that the NASA innovation is not limited to any particular solar cell technology. NASA has built prototypes and tested functionality before and after inflation. As shown in the current-voltage currents below, deployment does not damage the cell performance.



The graph above depicts the current-voltage curves measured when testing NASA prototype devices. Pre-deployment curves are illustrated in blue and post-deployment curves are illustrated in red.

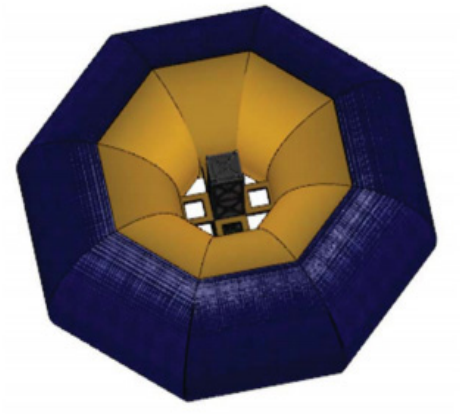
APPLICATIONS

The technology has several potential applications:

- **Aerospace —** power for CubeSats, small satellites, and solar electric vehicles
- **Military —** portable and field-deployable power systems
- **Consumer —** power for emergency response operations

PUBLICATIONS

Patent Pending



The solar power array technology could be utilized by small satellites.

More Information

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