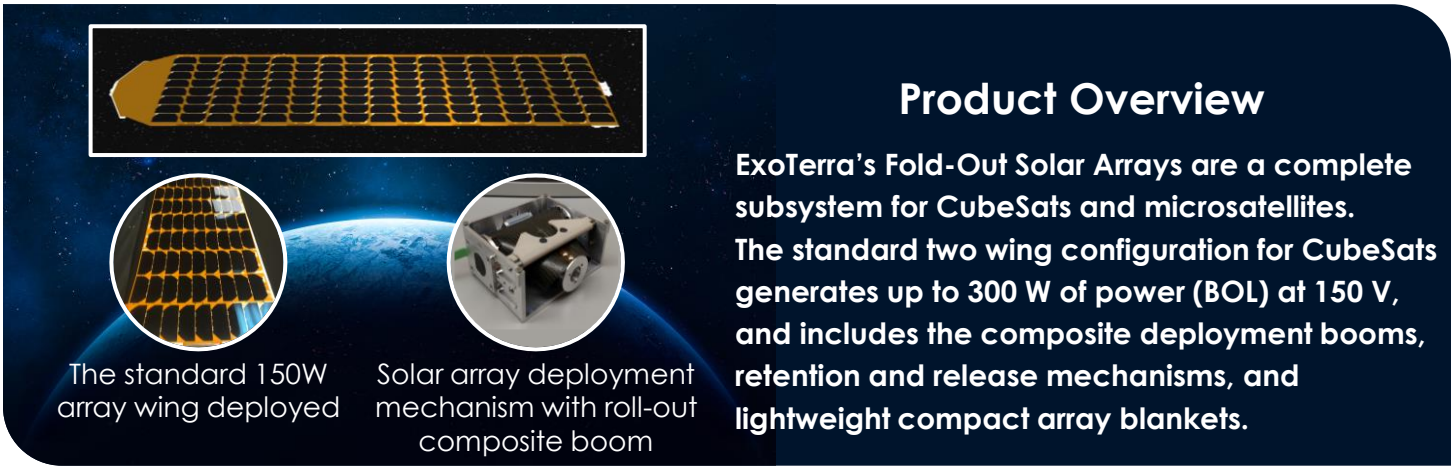
EXOTERRA

Fold-Out **Solar Arrays**



The standard 150W array wing deployed

Solar array deployment mechanism with roll-out composite boom

Product Overview

ExoTerra's Fold-Out Solar Arrays are a complete subsystem for CubeSats and microsatellites. The standard two wing configuration for CubeSats generates up to 300 W of power (BOL) at 150 V, and includes the composite deployment booms, retention and release mechanisms, and lightweight compact array blankets.

Unique Capabilities for CubeSats and SmallSats

ExoTerra's Fold-Out Solar Arrays radically improve the power capability of CubeSats and microsatellites. The high specific power and stowed power density are ideal for spacecraft with tight mass and volume constraints. The solar arrays can triple the amount of power available to a 6U bus through conventional array designs, power that can be used for electric propulsion, advanced payloads, and high-bandwidth telecommunications.

Features (per wing)

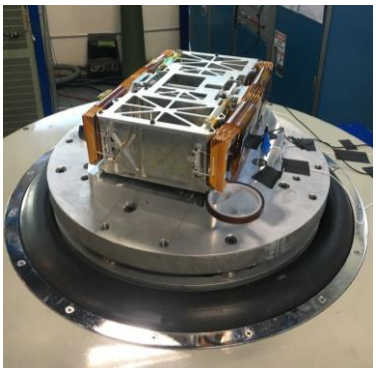
Mass: 1.07 kg
Power: 150 W BOL
Volume: 0.85 U stowed
Voltage: 28 or 150 V
Cell Efficiency: 29.5%
Specific Power: 140 W/kg
Power Density: 0.17 W/cm^3 (BOL, stowed)
Scalable from 75-300 W

Increasing Specific Power by 50%

The common 150 W array wing stows into a package initially sized for use on a 6U CubeSat. The stowed array is 354mm long by 71mm wide by 98mm high. Deployed, the array is 368 mm wide by 1,713 mm long. The array provides a specific power of 140 W/kg at beginning of life, increasing specific power by 50% compared to similar arrays. Total mass including R&R mechanisms is 1.07 kg and the stowed power density is 0.17 W/cm^3.

To optimize efficiency, the fold-out array produces 150 W (BOL) at 150 V, using 29.5% efficient SolAero ZTJ solar cells in multiple strings. The array's electrical layout permits the isolation of each cell, minimizing the impact on power output in case of cell failure in service. Basic deployment control and health-monitoring functions are built into the blanket itself, minimizing the number of signals required to extend and operate the array.

In recent environmental qualification testing under a Phase II NASA SBIR, a prototype fold-out array demonstrated 139 W of power output at standard AM0 conditions. The arrays also completed testing to ESPA shock, vibration, and thermal cycling environments.



150W standard arrays being configured for vibration testing

For more information contact:

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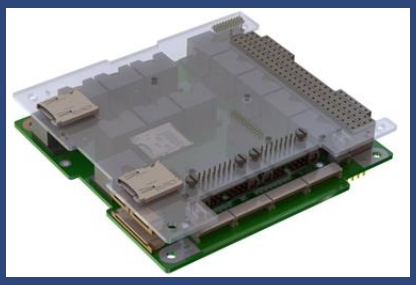
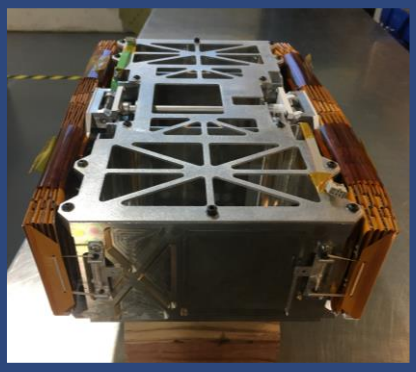
About ExoTerra

ExoTerra was founded in 2011 with a vision of reducing the cost of space exploration. We pursue this goal by developing affordable technologies that minimize spacecraft mass and volume while enhancing their performance and offering unique capabilities.

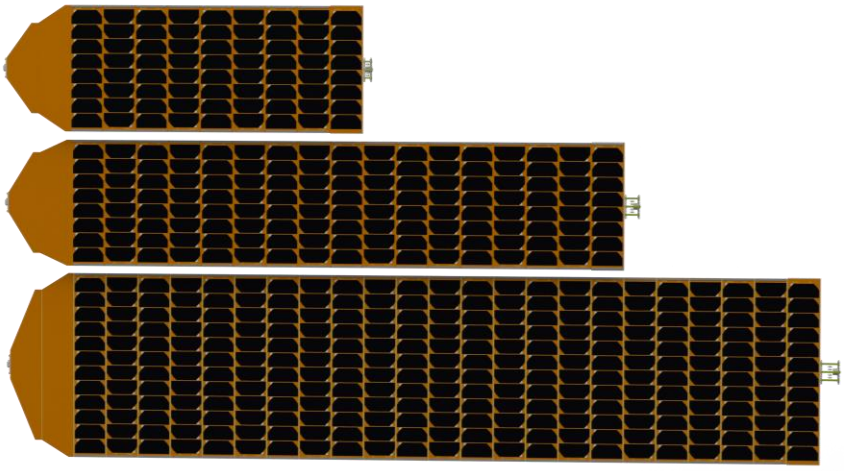
Since our founding, we have grown to 35 engineers with skills in structural, mechanical, and systems design and analysis, thermal protection and analysis, and electrical engineering. We design and build high capability power and propulsion components, subsystems, and fully-integrated buses for CubeSats and small satellites.



ExoTerra's PDU Card



Solar Array Stowed Configuration



Solar array scales based on mission requirements. Shown above are 75, 150 and 300 W deployed solar arrays with lengths of 0.98 m, 1.7 m, and 2.4 m.

A Scalable Part of an Overall Power and Propulsion System

ExoTerra's fold-out array scales to meet mission-specific power needs by adding or reducing folds, minimizing NRE. Array power output can be customized between 75 W and 300 W per wing by changing the length of the blanket and boom. The maximum power output for a CubeSat with two arrays, based on the width of a CubeSat and max length-to-width ratio, is 300 W. The maximum power output for an ESPA class satellite is 600 W, assuming two arrays.

Along with solar arrays, ExoTerra offers a full electric power system for CubeSats and microsatellites. This modular system includes power processing, power distribution and battery regulation, energy storage, and full-rotation single-axis gimbals, as needed for specific spacecraft applications.

ExoTerra's power distribution unit (PDU) card converts the array's 150 V power output to regulated 3.3, 5, 12 and 28 V bus supplies in user-selectable combinations, including user-specified non-standard voltages where needed. The card also monitors and controls battery conditions and charging operations.

ExoTerra's solar electric propulsion system (SEP) is a complete system for CubeSats and microsats that includes the fold-out solar arrays, Halo Hall-effect thruster, a propellant storage and distribution system, a high efficiency power processing unit, a power distribution system, and thrust vector control. ExoTerra's SEP system is a high impulse, radiation tolerant propulsion system that expands the mission potential of CubeSats by allowing them to attain and maintain targeted orbits.

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