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Quest for electricity helps power space structures work

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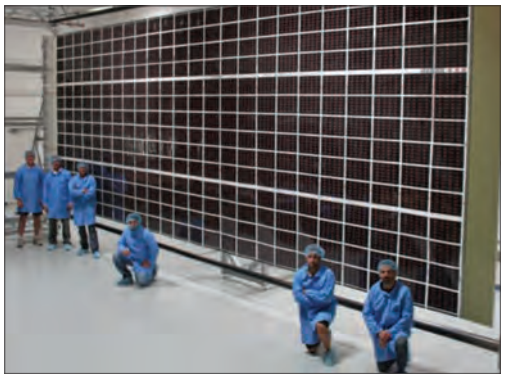
*The **Spacecraft Structures Technical Committee** is focused on the unique challenges associated with developing novel structural systems that operate in space environments.*

The year brought progress toward the **Sunjammer** solar sail technology demonstration mission planned for late 2014 by NASA's Space Technology Directorate. Sunjammer, named after a short story by Sir Arthur C. Clarke, seeks to demonstrate the feasibility of using state-of-the-art technologies to navigate a solar sail in space. The mission plans to deploy a 1,200-m² sail and subsequently fly it to a sub-L1 location. The program demonstrated the deployment of a quadrant of the sail in a test facility earlier in the year. Sunjammer will be boosted to geostationary orbit as a secondary payload and will employ an onboard propulsion system to reach an Earth escape orbit before deployment of the sail. The mission is a collaboration by L'Garde, NASA, Space Services Holdings, Micro Aerospace Solutions, the National Oceanic and Atmospheric Administration, Imperial College London, and the University College London.

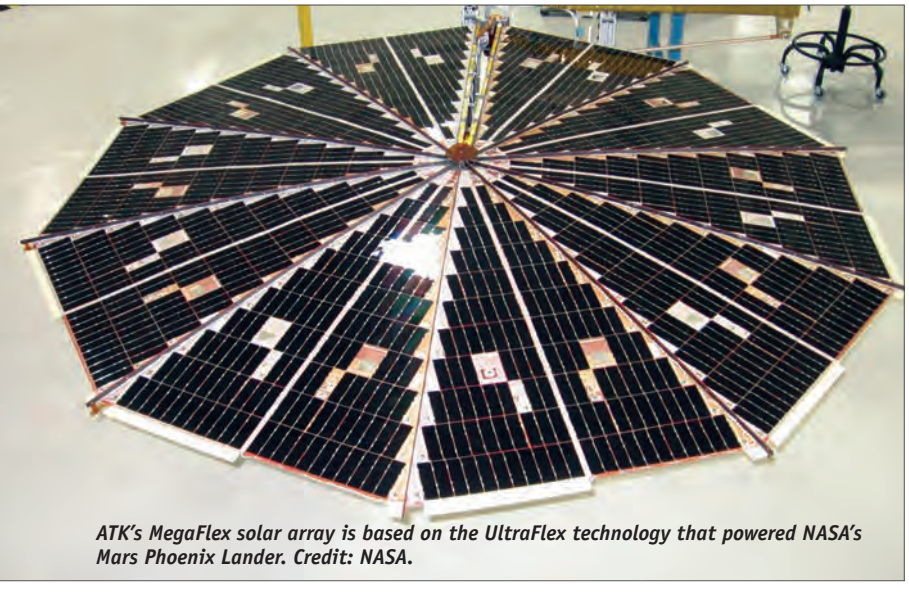
Lightweight space power deployables have also seen significant progress this year. ATK Space Systems, also under NASA's Space Technology Program, has tested and delivered the first two of 10 **UltraFlex wings** that will fly on Orbital Sciences' Cygnus spacecraft for resupply missions to the ISS. Key subsystems of this latest UltraFlex flight assembly are being directly leveraged to develop and demonstrate that the power and performance of this heritage membrane array technology can be scaled up significantly. It could then support near-term missions requiring 30-50 kW of power, such as the planned **Asteroid Redirect Mission**, and also future 250-kW-class **solar-electric propulsion** (SEP) systems. A 10-m MegaFlex wing has been built and is being validated with a full complement of standard system and subsystem tests. These tests will conclude with complete full-system end-to-end deployment and deployed dynamic testing, both within a thermal vacuum environment.

The Roll-Out Solar Array's flex-blanket configuration enables high power levels. Credit: NASA.



Deployable Space Systems of Goleta, California, is also developing an advanced high-powered solar array system under the same program to support future SEP missions. SEP is a key capability required for extending human presence throughout the solar system. The company's development work focuses on drastically reducing the weight, stowed volume, and cost of solar array systems relative to current systems, and on enabling potentially hundreds of kilowatts of power production. The company designed, analyzed, and tested a scalable 10-15-kW-size **Roll-Out Solar Array** wing system, known as **ROSA**, to validate deployment functionality, deployed dynamics, and vibration survivability. Efforts now focus on the design, analysis, and testing of a larger ROSA wing system capable of generating more than 30 kW at BOL (beginning of life). This effort is supplemented by the design, analysis, and testing of supporting deployable structural elements to demonstrate extensibility to 300 kW and higher.

The past year has also marked an important transition within the structures community as the AIAA **Gossamer Spacecraft Program Committee** formally converted to the new Spacecraft Structures Technical Committee. This newly formed technical committee is focused on the unique challenges associated with the design, analysis, fabrication, and testing of spacecraft structures. The committee is actively recruiting AIAA members interested in advancing the state of the art in this field.



ATK's MegaFlex solar array is based on the UltraFlex technology that powered NASA's Mars Phoenix Lander. Credit: NASA.