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2014 IN REVIEW

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Space structures for communication, exploration

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*The **Spacecraft Structures Technical Committee**, formerly the Gossamer Spacecraft Program Committee, focuses on the unique challenges associated with the design, analysis, fabrication, and testing of spacecraft structures.*

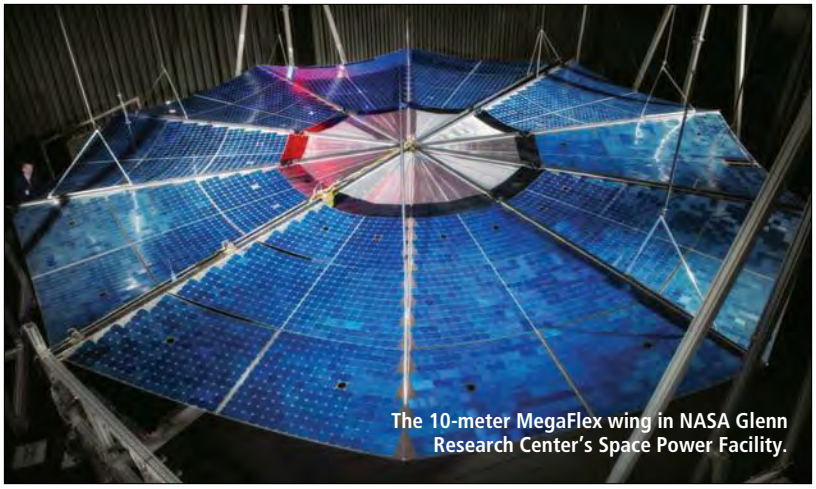
Ball Aerospace and Technologies recently completed testing in Boulder, Colo., of a foldable, membrane-based telescope called **MOIRE**, for the Membrane Optical Imager for Real-Time Exploitation platform. An orbital version would consist of a 20-meter-diameter optic to provide real-time video capabilities from geosynchronous orbit. The current development phase tested a complete optic system with a 5-meter-diameter membrane optic. Three MOIRE-related papers were presented at AIAA's SciTech 2014 conference, covering material and structural analyses, as well as preliminary results.

In the radio frequency domain, Harris Corp. has developed, built and tested **unfurlable** and **fixed-mesh reflector** designs with demonstrated performance up to Ka-band and higher frequencies. Enabling this FMR development is a new, high-density, gold-plated mesh reflector. The lightweight FMR structure leverages a flight proven, lightweight advanced composite sandwich panel egg-crate construction to support the mesh. For large sizes of approximately 3.5 meters, total reflector mass savings approaching 50 percent of a similar solid graphite reflector can be achieved. Spacecraft mass savings can also be realized from this design due to its unique characteristic that virtually no acoustic loading is generated from the reflector surface. Concurrent with the ongoing FMR qualification program, flight article production is underway on the world's first Ka-band unfurlable mesh reflectors and system level testing was expected to begin in Melbourne, Florida, in September.

This year has also seen continuing progress in lightweight **space power deployables**. Under a NASA technology development contract, ATK Space Systems has advanced the flight-readiness of its **MegaFlex** array system to Technical Readiness Level 6, an activity supported by component testing in unique environments, including high-density plasma. Testing was completed on a 10-meter flight-like wing at NASA Glenn Research Center's Space Power Facility outside of Cleveland. Under that same program, Deployable Space Systems Inc., with the support of NASA Glenn, Langley Research Center in Virginia and the Jet Propulsion Laboratory in Pasadena, has significantly matured its **Roll-Out Solar Array** — ROSA — and derived Mega-ROSA solar array system technology to TRL 6. The array underwent detailed design, analysis, build and full spectrum validation testing at Boeing's test facility in El Segundo, California, and has resulted in a high TRL that will facilitate near-term, high-power, high-voltage missions requiring 50 kilowatts to 1 megawatt of power.

Complementary to its work on the Sunjammer solar sail mission, NASA also began development work this year on two CubeSat-class deep space solar sail missions, each using a solar sail measuring approximately 85 square meters. One of these missions, the **Near Earth Asteroid Scout**, will carry an imager to provide initial reconnaissance of an asteroid for possible future human exploration. Another mission, the **Lunar Flashlight**, will study the significant ice deposits in the Moon's permanently shadowed craters. Its solar sail will be used as a mirror to steer sunlight into the craters while a spectrometer analyzes the reflected light to determine the composition of what is being illuminated. Both of these missions are planned as secondary payloads on the Space Launch System Exploration Mission 1, which will be the first flight of the SLS rocket.

NASA



The 10-meter MegaFlex wing in NASA Glenn Research Center's Space Power Facility.

The Membrane Optical Imager for Real-Time Exploitation telescope undergoes ground testing at Ball Aerospace.

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