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IN REVIEW



TWO BAD DAYS
Questioning conventional wisdom after Antares, Virgin Galactic/Page 4

Large and small systems make progress

by Samantha Infeld

The Space Systems Technical Committee fosters the development, application, and operation of space systems and addresses emerging issues in the area.

Space system launches and announcements this year were increasingly about small and commercial systems, including a constellation of CubeSats. But there were also major tests completed of NASA's Orion spacecraft, part of the Space Launch System for human exploration beyond Earth orbit and backup transportation to the International Space Station.

Coming into 2014 many were following the progress of the Chinese **Yutu rover** after its landing on the moon in December 2013, when just before it entered its second lunar night on Jan. 25 it failed to fold its solar panel down properly after hitting a rock. This configuration left its sensitive electronics exposed to the cold and it was thought the rover would not wake up again. But the rover came back online in February and sent back data for months as its instruments continued to degrade while Yutu managed to survive successive lunar nights.

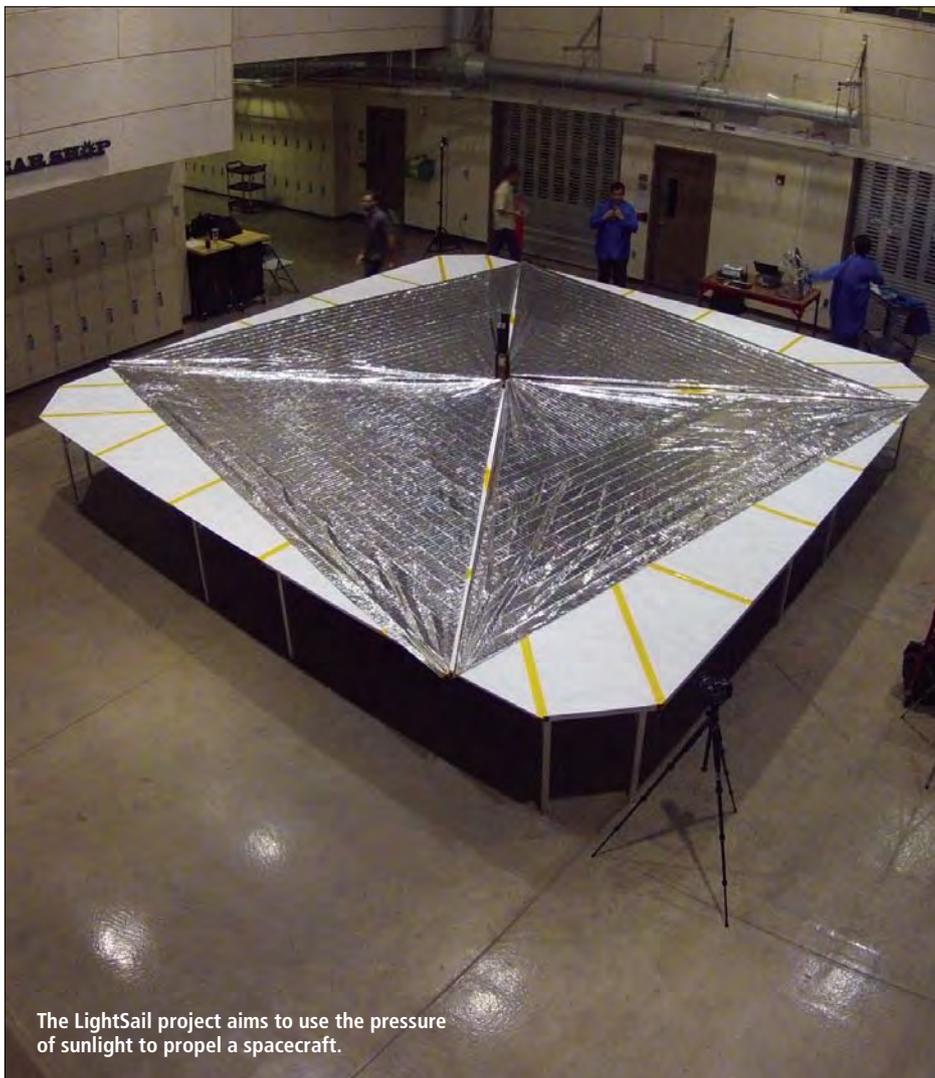
In February and March, **Planet Labs'** Flock 1 of 28 CubeSats, the world's largest constellation of Earth-imaging satellites, launched from the ISS along with five other CubeSats in a record-breaking deployment. With subsequent launches, Planet Labs' now has 71 CubeSats in orbit and the company is approaching the capability to image the entire Earth, every day.

After months of testing and critical design reviews in 2014, NASA selected two companies, Boeing and SpaceX, for its **Commercial Crew Program** to provide transportation to the ISS and low-Earth orbit. Boeing offered the CST-100 crew capsule and SpaceX proposed the Dragon v2, a crewed version of the Dragon cargo vehicle that has made several resupply missions to the ISS.

The parachute system for NASA's **Orion** deep-space vehicle was tested over Arizona in June following tests in January, and the largest heat shield ever constructed was installed on the Orion crew module at Kennedy Space Center in Florida. Then in August, ocean testing off California was completed in preparation for the first space flight test, scheduled for December. These engineering feats were accomplished in cooperation with several large and small companies, including prime contractor Lockheed Martin and Analytical Mechanics Associates.

In June, NASA selected proposals for six-month studies to mature system concepts and assess the feasibility of potential commercial partnerships to support the agency's **Asteroid Redirect Mission**. Notably for space systems, Airborne Systems, Jacobs, Altius Space Machines and Space Systems/Loral are carrying out the asteroid capture systems studies, while The Planetary Society, Planetary Resources, Applied Physics Laboratory, Honeybee Robotics and Deep Space Industries are developing secondary payload possibilities.

In August, The Planetary Society announced 2015 and 2016 launch dates for its **LightSail-1** spacecraft, a CubeSat to be launched by SpaceX. Also that month, the European Space Agency's Rosetta mission achieved a milestone by becoming the first spacecraft to rendezvous with a comet, 67P/Churyumov-Gerasimenko. In November, Rosetta deployed the Philae robotic lander, which settled on the comet. ▲



The LightSail project aims to use the pressure of sunlight to propel a spacecraft.

The Planetary Society