19th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Hitchhiking to the Moon (8)

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SYMPOSIUM KEYNOTE: LIGHTSAIL: SPACECRAFT READY FOR LAUNCH

Abstract

The Planetary Society has completed the development, manufacture, integration and test of the LightSail spacecraft and placed it into sealed storage awaiting a launch opportunity for flight to medium Earth orbit. Our goal is controlled flight to demonstrate using the force of solar pressure to increase orbit energy. If a launch opportunity can be found this year, this will be the first such flight to demonstrate such an orbital energy increase in Earth orbit.

Solar sailing has become a hot topic of interest in part as a result of the successful flight of the Japanese IKAROS mission in heliocentric orbit, and in part because of the evolution of nanosat technology in the widespread CubeSat community and applied to solar sails by NASA with their passive NanoSail-D successfully deployed for drag in the Earth's atmosphere.

LightSail combines the nanosat and sail technologies with a fully functional and controllable spacecraft including an attitude control system, solar power arrays, 2-way radio telemetry and communications, gyros, accelerometers and two on-board cameras. A novel motorized sail deployment system utilizing Air Force Research Laboratories TRAC booms permits contolled pace deployment of the 32 square meter sail (5.5 meters x 5.5 meters). The spacecraft total mass, contained within three CubeSat units (3U) is less than 5 kg. The resulting characteristic acceleration from the solar pressure is approximately 6 micro-g, making it the highest acceleration solar sail spacecraft yet developed for flight.

Although LightSail has been designated for flight in NASA's Education Launch of Nanosats (ELaNa) program for over a year, no opportunity for a secondary payload flight to medium-Earth orbit (above approximately 800km) where light pressure will dominate atmospheric drag has yet been identified. Discussions with NASA, other U.S. government agencies, commercial launch providers and foreign launch organizations are continuing. Cooperation with NASA through a Space Act Agreement for nanosatellite development is helping with the launch arrangements. Mission operations will be conducted by a team at California Polytechnic University and Georgia Institute of Technology.

The development of the LightSail spacecraft has led to follow-on proposals in NASA and industry for flights beyond Earth orbit to interplanetary space and even to concepts for robotic interstellar precursors. The paper will fully describe the LightSail spacecraft systems and subsystems and mission operations plan.