

SPACE SYSTEMS SYMPOSIUM (D1)  
Innovative and Visionary Space Systems Concepts (1)

Author: Dr. Tomas Svitek  
Stellar Exploration Inc, United States

Dr. Bill Nye  
The Planetary Society, United States  
Mr. James Cantrell  
Strategic Space Development Inc, United States  
Dr. Bruce Betts  
The Planetary Society, United States

VOYAGE CONTINUES - LIGHTSAIL-1 MISSION BY THE PLANETARY SOCIETY

**Abstract**

The Planetary Society is taking solar sailing to the next level in the latest and biggest project in our history. After the loss of the previous mission (Cosmos-1), we are restarting the effort with new technology and the highest performance sail spacecraft ever attempted. This new solar sail project, boosted by an anonymous donation, is the beginning of an innovative program that will launch three separate spacecraft over the course of several years. Our program begins with the LightSail-1 mission, which will demonstrate that sunlight can propel a spacecraft in Earth orbit. LightSail 2 and 3, more ambitious still, will reach farther into space.

The LightSail-1 mission is taking advantage of recent miniaturization advances by leveraging the Cubesat technology. The flight system is designed around the 3U Cubesat spacecraft, with the key contributions by Strategic Space Development, Stellar Exploration Inc, and California Polytechnic University, San Luis Obispo. The top Cubesat unit third of the Lightsail-1 stack houses the centralized avionics (commanding, telemetry, attitude control and power management and storage). The other two Cubesat units house the solar sail module. Payload (cameras and solar radiation pressure sensors) are also integrated within the spacecraft.

LightSail-1 will have four triangular sails, arranged in a diamond shape. Constructed of 32 square meters of mylar film, LightSail-1 will be placed in an orbit at least 850 kilometers above Earth, high enough to escape the drag of Earth's uppermost atmosphere. At that altitude the spacecraft will be subject only to the force of gravity keeping it in orbit and the pressure of sunlight on its sails increasing the orbital energy. The mission will give us a good, clean trial of radiation pressure from sunlight as a means of propulsion. We are planning several independent measurements of the orbital energy increased, including ground-based telescopes and onboard instruments. The LightSail-1 launch is anticipated in 2011, pending final arrangements for the piggyback launch opportunity.