

IAF SPACE PROPULSION SYMPOSIUM (C4)
Joint Session between IAA and IAF for Small Satellite Propulsion Systems (8-B4.5A)

Author: Dr. Bruce Betts
The Planetary Society, United States

Dr. David Spencer
Purdue University, United States

Dr. John Bellardo
Cal Poly, SLO, United States

Mr. Bill Nye
The Planetary Society, United States

Mr. Alex Diaz
Ecliptic Enterprises Corporation, United States

Ms. Barbara Plante
United States

Mr. Justin Mansell
Purdue University, United States

Mr. Michael Fernandez
Cal Poly, SLO, United States

Mr. Cole Gillespie
Cal Poly, SLO, United States

Dr. Darren Garber
NXTRAC, United States

LIGHTSAIL 2: CONTROLLED SOLAR SAIL PROPULSION USING A CUBESAT

Abstract

The Planetary Society's LightSail 2 mission will seek to demonstrate, for the first time, controlled solar sail propulsion using a CubeSat sized spacecraft. Its precursor test mission, LightSail 1, flew a successful mission in 2015. LightSail 2 is scheduled to fly in the next few months. LightSail 1 demonstrated functionality of the 3U CubeSat spacecraft and deployment of a 32 square meter solar sail. Whereas LightSail 1 was a test mission with an altitude too low to demonstrate controlled solar sailing because of atmospheric drag, LightSail 2 will fly high enough to enable demonstration of controlled solar sailing. LightSail 2 will launch on the third launch of the SpaceX Falcon Heavy rocket, as part of the U.S. Department of Defense Space Test Program-2 payload. On orbit, LightSail 2 will deploy from the Georgia Tech led Prox-1 spacecraft selected to fly as part of the University Nanosat Program. Based on lessons learned from LightSail 1 and the required capabilities for the LightSail 2 mission, we have made numerous modifications, additions, and upgrades to hardware and software to improve the spacecraft function and operability relative to LightSail 1. LightSail 2 also significantly expands the Attitude Determination and Control Subsystem (ADCS). LightSail 2 will demonstrate controlled solar sailing by spending half of every 90 minute orbit with the sail perpendicular to the sunlight, gathering momentum from light hitting the sails. Then, the spacecraft will rotate 90 degrees to "feather" the sail as the spacecraft heads back in the Sun direction. It then rotates 90 degrees again and the process repeats, thus altering the orbit. This presentation will give details on the modifications and improvements to LightSail 2 compared to LightSail 1, the concept of operations for LightSail 2, and the testing done to maximize LightSail 2's probability

of success. Launch will likely occur before IAC 2019 in which case mission results will be presented. The LightSail program is entirely privately funded through contributions from Planetary Society members and donors worldwide. More information on the LightSail program can be found at sail.planetary.org