The Tethering and Ranging mission of the Georgia Institute of Technology (TARGIT)

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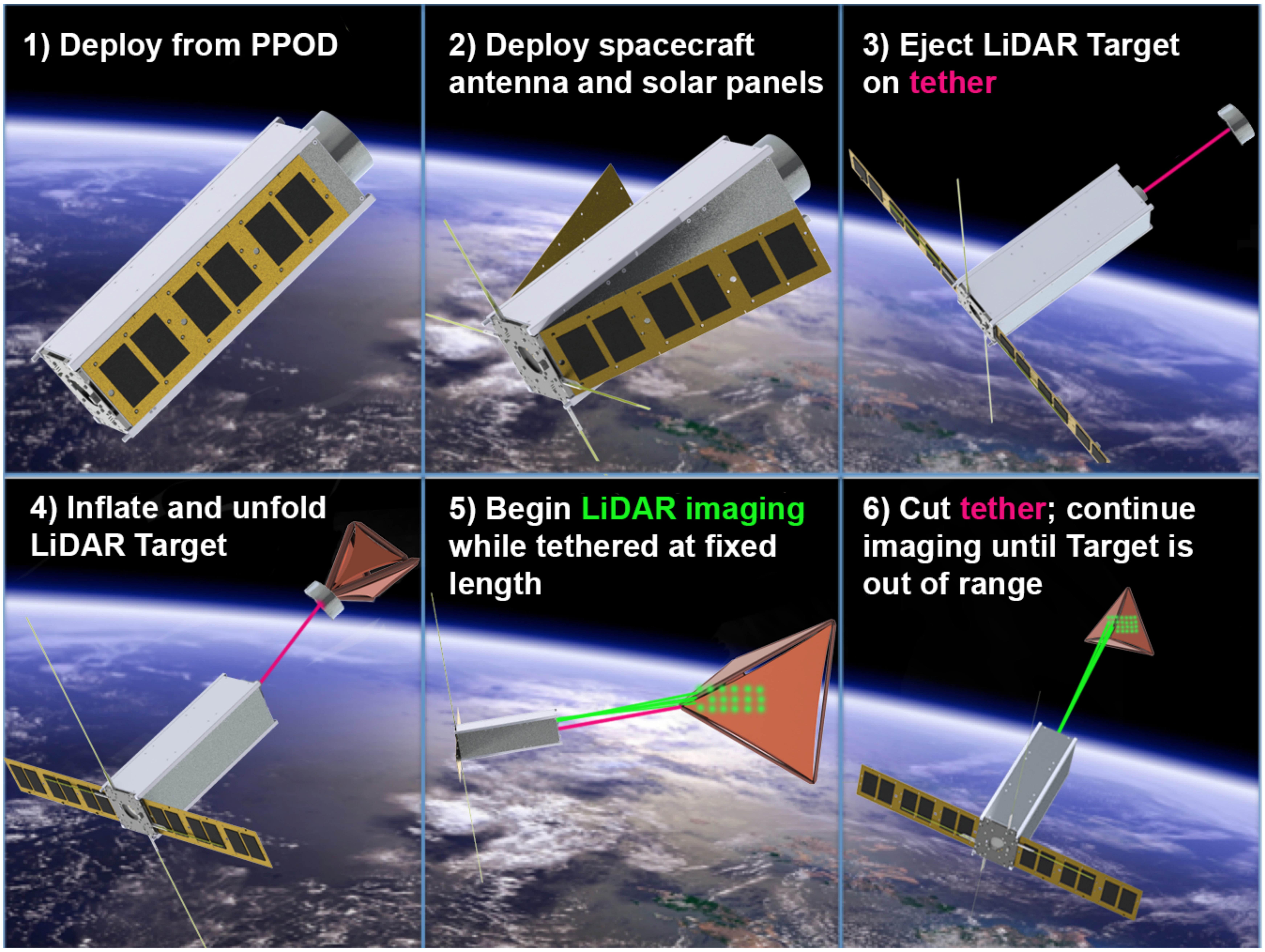
Overview

The objective of this project is to develop, test, and integrate a miniaturized LiDAR imaging camera into a 3U CubeSat. A parallel development will also design and test a deployable inflatable that will serve as the LiDAR camera's primary imaging target. The goal of the CubeSat mission is to demonstrate cm-level altimetry precision over tens of kilometers. The conceptual operations for the various mission phases is shown in the panels below. **The applications for a compact laser altimetry system are numerous, and are particularly valuable for planetary missions** interested in the topographic mapping of targets such as moons, asteroids and comets. This project is sponsored by NASA's Undergraduate Student Instrument Program (USIP), and has involved 30+ graduate and undergraduate students to date. The projected launch date for the mission is in 2019.

Conceptual Operations



Conclusions and Outlook

The successful implementation of the TARGIT mission will 1) Demonstrate the capability to gather both imaging and scanning LiDAR images of a remote target at the cm-level, and 2) Demonstrate the capability for CubeSats to target and track objects or points of interest at distances representative of a fly-by or low-orbit (10km).

For planetary missions, this technology would provide a variety of capabilities that would benefit both the science and mission operations. Accurate topographic information provides information on surface structure (slopes, roughness, etc.) that in turn gives insight into the target body's origin/composition, as well as 3D context to any coincident (hyperspectral) imagery. The same laser ranging systems can be used for guidance and navigation of the spacecraft, landing site reconnaissance, or even direct-to-Earth laser communications.

There are a number of celestial bodies in the outer solar system that have yet be explored in depth, and are unlikely to be the target of a large-scale dedicated NASA Explorer-class mission in the near future. These include various planetary moons, asteroids, and comets. These destinations are prime candidates for a CubeSat mission. The low cost of CubeSats and their independence from the primary mission as a rideshare create little risk if a failure occurs, but if successful, the science return could be tremendous. As such, the efforts of this project support the notion that CubeSats can enhance the science return from future planetary missions by maturing technology readiness, or by offering low-risk rideshare/hosted-payload opportunities.

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