

Solar Sail Propulsion For Alternate Redirection Project

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The Solar-SPAR project focuses on the design of a CubeSat equipped with a solar sail to harness naturally occurring solar flux to use in a novel alternate propulsion method to maneuver a secondary payload into a new orbit. Centripetal acceleration is created by maximizing the amount of solar flux on the solar sail by tilting the sail canopy in 90-degree increments. This flux imparts a small force, causing the CubeSat assembly to rotate around its center of gravity. A secondary payload kept inside the spacecraft will be released when the CubeSat assembly is rotating, allowing the assembly to impart an increase in velocity to the secondary payload upon its release, delivering it into a new orbit. Such dynamic maneuvering has the capability to be used in many applications, such as for deorbiting debris and potentially changing satellite orbits around the Earth, with the benefit of providing a low cost, low pollution method to assist with the implementation of future advancements in technology. This project includes parametric studies of solar sail motion, as well as conceptual and detailed designs of the CubeSat systems and deployment mechanisms, and an analog prototype designed and built for application on Earth.