

Status of Solar Sail Propulsion Within NASA – Moving Toward Interstellar Travel

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NASA is developing solar sail propulsion for two near-term missions and laying the groundwork for their future use in deep space and interstellar precursor missions. Solar sails use sunlight to propel vehicles through space by reflecting solar photons from a large, mirror-like sail made of a lightweight, highly reflective material. This continuous photon pressure provides propellantless thrust, allowing for very high ΔV maneuvers on long-duration, deep space exploration. Since reflected light produces thrust, solar sails require no onboard propellant.

The Near Earth Asteroid (NEA) Scout mission, managed by MSFC, will use the sail as primary propulsion allowing it to survey and image one or more NEA's of interest for possible future human exploration. *Lunar Flashlight*, managed by JPL, will search for and map volatiles in permanently shadowed Lunar craters using a solar sail as a gigantic mirror to steer sunlight into the shaded craters. The *Lunar Flashlight* spacecraft will also use the propulsive solar sail to maneuver into a lunar polar orbit. Both missions use a 6U cubesat architecture, a common an 85 m² solar sail, and will weigh less than 12 kilograms. Both missions will be launched on the first flight of the Space Launch System in 2018.

NEA Scout and Lunar Flashlight will serve as important milestones in the development of solar sail propulsion technology for future, more ambitious missions including the Interstellar Probe – a mission long desired by the space science community which would send a robotic probe beyond the edge of the solar system to a distance of 250 Astronomical Units or more. This paper will summarize the development status of NEA Scout and Lunar Flashlight and describe the next steps required to enable an interstellar solar sail capability.