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Author: Mr. Les Johnson

National Aeronautics and Space Administration (NASA), Marshall Space Flight Center, United States,
c.les.johnson@nasa.gov

NEAR EARTH ASTEROID SCOUT: NASA'S SOLAR SAIL MISSION TO A NEA

Abstract

NASA is developing a solar sail propulsion system for use on the Near Earth Asteroid (NEA) Scout reconnaissance mission and laying the groundwork for their use in future deep space science and exploration 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 Delta-V 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, funded by NASA's Advanced Exploration Systems Program and managed by NASA MSFC, will use the sail as primary propulsion allowing it to survey and image Asteroid 1991VG and, potentially, other NEA's of interest for possible future human exploration. NEA Scout uses a 6U cubesat (to be provided by NASA's Jet Propulsion Laboratory), an 86 square meter solar sail and will weigh less than 12 kilograms. NEA Scout will be launched on the first flight of the Space Launch System in 2018.

The solar sail for NEA Scout will be based on the technology developed and flown by the NASA NanoSail-D and The Planetary Society's Lightsail-A. Four 7 m stainless steel booms wrapped on two spools (two overlapping booms per spool) will be motor deployed and pull the sail from its stowed volume. The sail material is an aluminized polyimide approximately 2.5 microns thick.

As the technology matures, solar sails will increasingly be used to enable science and exploration missions that are currently impossible or prohibitively expensive using traditional chemical and electric propulsion systems. This paper will summarize the status of the NEA Scout mission and solar sail technology in general.