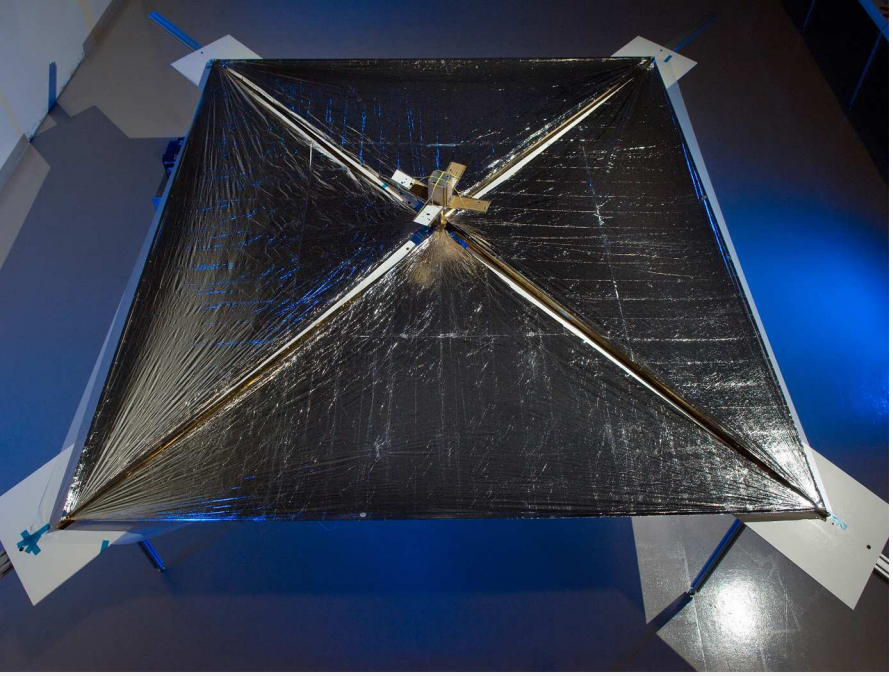


National Aeronautics and
Space Administration

Propulsion

SMART Solar Sail

A super miniaturized autonomous reconfigurable technology solar sail

NASA GSFCs SMART (Super Miniaturized Autonomous Reconfigurable Technology) Solar Sail is a deployable, fully autonomous, solar sail for use in a very fine station keeping of a spacecraft. The solar sail would be highly deformable from an initially highly compressed configuration, yet also capable of enabling very fine maneuvering of the spacecraft by means of small sail-surface deformations. The SMART Solar Sail would be connected to the main body of the spacecraft by a SMART multi-tether structure, which would include microelectromechanical system (MEMS) actuators like those of the frame plus tethers in the form of longer versions of the struts in the frame.

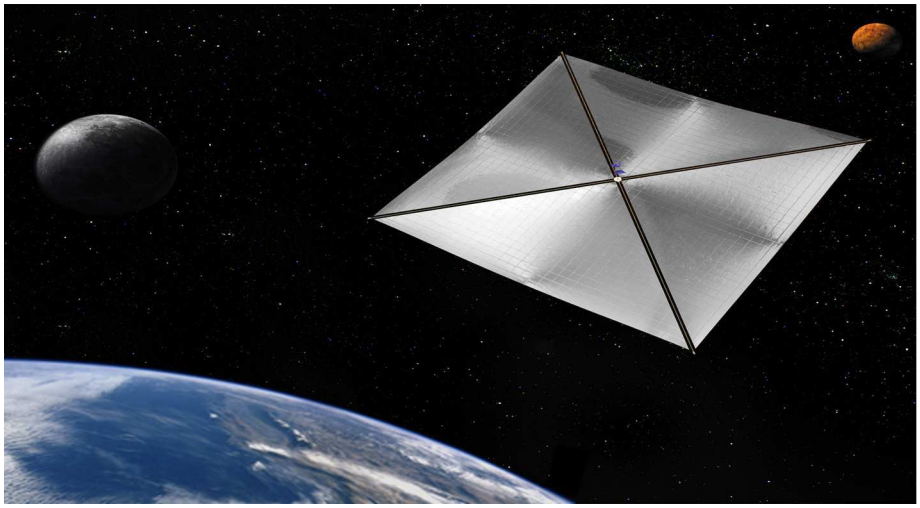
BENEFITS

- Autonomous: The SMART Solar Sail is designed to be self-sufficient
- Highly deformable from from an initially highly compressed configuration
- Maneuverability: Capable of very fine maneuvering by small surface deformation

technology solution

THE TECHNOLOGY

The SMART solar sail includes a reflective film stretched among nodes of a SMART space frame made partly of nanotubule struts. A microelectromechanical system (MEMS) at each vertex of the frame spools and unspools nanotubule struts between itself and neighboring nodes to vary the shape of the frame. The MEMSs is linked, either wirelessly or by thin wires within the struts, to an evolvable neural software system (ENSS) that controls the MEMSs to reconfigure the sail as needed. The solar sail is highly deformable from an initially highly compressed configuration, yet also capable of enabling very fine maneuvering of the spacecraft by means of small sail-surface deformations. The SMART Solar Sail is connected to the main body of the spacecraft by a SMART multi-tether structure, which includes MEMS actuators like those of the frame plus tethers in the form of longer versions of the struts in the frame.



SMART Solar Sail

APPLICATIONS

The technology has several potential applications:

- NASA or private space missions involving the development of Solar Sails

PUBLICATIONS

Patent No: 7,769,488

More Information

National Aeronautics and Space Administration

Strategic Partnerships Office

Goddard Space Flight Center

Code 102
Greenbelt, MD 20771
301.286.5810
techtransfer@gsfc.nasa.gov

http://technology.nasa.gov/

www.nasa.gov

NP-2015-04-1607-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

GSC-14762-1
GSC-TOPS-16