

SPACE PROPULSION SYMPOSIUM (C4)
Advanced Propulsion: "Non Electric Non Chemical" (8)

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CONCEPT FOR A MODULAR SOLAR SAIL

Abstract

Traditionally, solar sails were designed as one or a few membranes of very huge surface. To be launched from Earth, they have to be folded or wound into a restrained volume, usually inside of the satellite they are assumed to propel. Once in space, the sail deployment in order to obtain a flat surface has been the subject of assiduous research, due to the problem complexity. It should be noted that the deployment device stays part of the sail/satellite bundle and makes a significant load at the expense of the payload. Making monolithic solar sails of huge surfaces represent a problem so hard to solve that current research concentrate on micro sails for which only payloads of very low weight are possible.

This paper describes the concept of a modular solar sail. Each drum-like elementary sail is a hexagonal frame on which a membrane is stretched during manufacturing. The diameter of the elementary sail is limited by the diameter of the launcher's payload cap. Hundreds of such sail elements can be stored on top of a single launcher. Sail elements have enough autonomous control capability to behave relative each other as birds in a flock and to perform self assembly into an arbitrary large composite sail. The payload is attached to a fake sail element around which the sail is grown.