Paper ID: 102611
oral

23rd IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Innovative Concepts and Technologies (1)

Author: Prof. Christer Fuglesang
Sweden

Mr. Gunnar Tibert
KTH Mechanics, Royal Institute of Technology, *(country is not specified)*
Mr. Elias Krantz
Royal Institute of Technology (KTH), Sweden

KEYNOTE: ION THRUSTERS AND DIFFRACTIVE MEMBRANES FOR REDUCING THE MASS OF THE PLANETARY SUNSHADE SYSTEM

Abstract

If global temperatures rise beyond tolerable levels, geoengineering solutions may become necessary. Among these, a space-based approach—specifically, the Planetary Sunshade System (PSS)—offers a potentially safer alternative with fewer unknown side effects compared to Earth-based methods. The PSS would consist of multiple large membranes positioned just beyond the Sun-Earth L1 point, blocking approximately 1

A primary cost driver of the PSS is its total mass, which is largely determined by the optical properties of the membranes. Since sunlight exerts force on the membranes, this force must be counteracted either by the Sun's gravitational pull or by small thrusters. The use of diffractive membranes, which slightly redirect sunlight instead of reflecting or absorbing it, significantly reduces this force. However, unlike reflective membranes, diffractive membranes cannot rely on solar sailing for maneuvering and thus require thrusters.

This study demonstrates that advanced, highly efficient ion thrusters could significantly reduce the total mass of the PSS while enabling its optimal positioning closer to L1. Additionally, the system's operations around this optimal position will be explored.