

Introduction: Design of Gossamer Spacecraft

IN this first of four special sections of the *Journal of Spacecraft and Rockets*, we are pleased to bring you a selection of papers originally presented at the 2001 Gossamer Spacecraft Forum (42nd AIAA Structures, Structural Dynamics, and Materials Conference, Seattle, Washington). Gossamer spacecraft (GS) have captured the imagination of many engineers and scientists of late because the technology is enabling of many applications and missions such as large communications and imaging apertures, solar sails and solar thermal propulsion, and planetary exploration and habitation.

The design of GS is challenged by the highly nonlinear behavior characteristics of ultralightweight and compliant structural systems. Because reduction in weight is usually achieved through some combination of reduction in girth or modulus (materials with lower densities often are accompanied by lower modulus) or both, GS typically exhibit high structural compliance or flexibility. Furthermore, materials of interest for GS are themselves complex, exhibiting nonlinear and often time-dependent constitutive behavior.

In addition to the usual issues required to be addressed in spacecraft design, GS design is particularly impacted by such issues as weight budgets, dimensional stability, and the use of joints, actuators, sensors, and the like.

Today, a number of issues in the design of GS are being addressed, including 1) large deformation static and dynamic behavior, 2) membrane wrinkling, 3) thermoelasticity, 4) vibrations, 5) interface design, 6) column/strut design, and 7) rational design of active and multifunctional GS.

We are pleased to be able to bring a selection of recent reports on such issues to you.

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