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Introduction: Experiment and Testing of Gossamer Spacecraft

IN this the fourth 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.

Conducting experiments and tests of GS structures exposes unique problems and situations not normally encountered with traditional structures. Two significant differences between the two types are the effects of gravity and ambient pressure conditions on the response of GS structures. Because they are extremely lightweight and flexible, far more than most lightweight metallic structure designs, GS structures are substantially harder to support for both static and dynamic tests. A 1g-gravity environment makes it very challenging to test large sections of membranes that can be tens of meters in length. The effects of ambient environmental conditions have shown the need for performing dynamic tests at vacuum conditions. Locating vacuum chambers of sufficient size, with large numbers of portholes, etc., has been shown to be a challenge itself.

Today, a number of issues in the experiment and testing of GS are being addressed, including 1) analytical model correlation to test data; 2) test methods and hardware adapted for GS structural testing, especially the use of laser vibrometers and vacuum chambers; and 3) laboratory tests to demonstrate GS inflation and deployment processes.

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

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