

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Space Structures - Dynamics and Microdynamics (3)

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DEPLOYMENT DYNAMICS OF MEMBRANE-BOOM WRAPPED STRUCTURES

**Abstract**

The membrane-boom deployable structures which consist of self-deployable tri-axis CFRP boom with skew fold/spiral fold membrane wrapped around a single hub, have been developing for several small satellite missions as, solar sails, de-orbiting membrane systems, thin film solar cell deployable membranes, and membrane antennas. The advantage is that the deployable booms hold the membrane in stowed state without holding mechanisms, thus the deployable membrane structures are applicable for small satellites.

As the deployment properties of the membrane-boom structures depend on the self-deploying properties of the CFRP booms, the design of the CFRP booms is significant for the deployable structures. Also, the deploy-ability of the membrane-boom structures have to be evaluated by the ground testing and numerical simulations.

This paper focus on the non-linear dynamic properties of the membrane-boom deployable structures in the course of deployment. Non-linear numerical analyses are performed for the deployable membrane-boom structures and experimental models are demonstrated for deployment. The results indicate the dynamic properties of membrane-boom deployable structures and non-linear buckling like properties for the deployable booms are discussed in detail. Finally, the optimal designing procedures of membrane-boom deployable structures are investigated.