Paper ID: 28792
oral

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Mr. Sebastian Meyer
German Aerospace Center (DLR), Germany

Mr. Martin Zander
German Aerospace Center (DLR), Germany
Mr. Marco Straubel
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
Prof. Christian Hühne
German Aerospace Center (DLR), Germany

ENVIRONMENTAL TESTING AND ANALYSIS OF A BOOM DEPLOYMENT MECHANISM FOR GOSSAMER-2

Abstract

DLR currently develops several deployment mechanisms for solar sailing spacecrafts. Two missions are currently in progress. One is the Gossamer-1 mission in which a 5 m by 5 m solar sail technology demonstrator is developed; the second is the planned, up scaled successor Gossamer-2 with a size of 20 m x 20 m. One goal of the development process in these missions is to achieve a deployment mechanism, which can be scaled up and used in future missions with larger sail areas (Gossamer-2: 20 m x 20 m, Gossamer-3: 50 m x 50 m) and later science missions. Within the DeployTech project the scalability of the Gossamer-1 deployment principle and mechanisms is being demonstrated for the Gossamer-2 size. DLR designed an up-scaled boom deployment mechanism, based on the smaller Gossamer-1 design, for a 14 m long CFRP boom with a double omega shaped cross section.

In this paper the concept and design of the up-scaled boom deployment mechanism are described, followed by the main part that addresses the environmental testing performed on the prototype of the up-scaled boom deployment unit. In a detailed manner the objectives, the test procedure and the results from thermal-vacuum, vibration and functional deployment tests are presented. Furthermore FE-Analyses for simulating the vibration tests are performed. In this regard the used FE-model is described and the obtained results are shown in detail. Consequently the simulated and measured results are compared and discussed.