

MATERIALS AND STRUCTURES SYMPOSIUM (C2)

Space Structures II - Development and Verification (Deployable and Dimensionally Stable Structures) (2)

Author: Prof. Joachim Block

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, joachim.block@dlr.de

A SELF-DEPLOYING AND SELF-STABILIZING HELICAL ANTENNA FOR SMALL SATELLITES

Abstract

Space antennas with a helical geometry are an advantageous choice for many applications, for instance if the transmission of electromagnetic waves with a circular polarization is intended, or if signals from terrestrial objects shall be received with a high angular resolution. In all these cases the desired electromagnetic properties of a helical geometry can be combined with the mechanical advantage that the antenna acts as a compression spring, provided that its core structure has the necessary high spring stiffness but can nevertheless easily be compressed. Such an antenna has been developed by DLR Institutes in Bremen and Braunschweig together with some industrial partners for a small satellite named AISat which shall be able to pursue the position of individual ships in critical sea areas in order to improve the security of seafare trade. The development was very challenging since the antenna must expand from a stowed stack length of only 10 centimetres to a total length of 4 meters. Only a special carbonfiber core under the conductive coating and a system of stabilizing cords led to a satisfying solution. Both the self-deployment and the self-stabilization function of this innovative antenna concept have been successfully tested and verified under zero-g-conditions in the course of a parabolic flight campaign. It could be convincingly demonstrated that the helical antenna can really achieve its desired contour in weightlessness within some seconds and maintain the required stability. Beyond the current application for the AISat satellite it is therefore a quite promising concept for future satellites.