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

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A STUDY INTO THE DEPLOYMENT VARIABILITY OF BUILT UP, TAPE SPRING BASED, SPACE DEPLOYABLE STRUCTURES

Abstract

Deployable structures are required for many satellite operations, to deploy booms for communications or area deployment for power generation, and many sophisticated mechanisms have been developed for these types of structures. However, tape springs, defined as thin metallic strips with an initially curved cross-section, are an attractive structural solution and hinge mechanism for satellite deployable structures because of their low mass, low cost and general simplicity. They have previously been used to deploy booms and array panels in various configurations that incorporate small two-dimensional tape hinges, but they also have the potential to be used in greater numbers to create larger, more geometrically complicated deployable structures.

This publication will investigate, using theoretical and experimental methods, the potential deployment variability of these structures. Non-uniform deployments can be due to variations in the structural properties of the tape springs or an unsynchronised release of the structure. To study this problem the investigation will focus on a deployable wall incorporating three lines of tape spring hinges mounted in pairs, totalling over 100 individual tape springs. The deployment dynamics will be studied experimentally and will be used to validate a finite element model of the structure. This finite element model will then be used to investigate the variation in deployment resulting from tape spring variations and non-uniform releases. The aim of this study is to identify the key properties that have the most significant effect on the deployment and the requirements of a release mechanism.