Paper ID: 17189
oral

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

Author: Mrs. Anne GIOVANNINI
Thales Alenia Space France, France, anne.giovannini@thalesaleniaspace.com

MULTIBODY ANALYSIS OF A TWO AXIS ORIENTED DEPLOYABLE SOLAR ARRAY

Abstract

Since many years, Thales Alenia Space has developed reliable tools and methods to secure the deployment of its large deployable structures.

In particular, the deployment of solar arrays is very critical for the satellite mission. Due to gravity and air effects, it is not possible to demonstrate on ground that the motorization margins will guaranty the reliability of the deployment. That's why it is crucial to built very efficient models thanks to three dimensional multibody software's.

Flight data were used to correlate those models and a good reliability has been obtained, so that solar arrays with very complex architectures like 7 times 8sqm panel per wing could be developed more easily.

In the recent past, the largest GEO Telecom Solar Generator (more than 113 sqm) was successfully deployed in space and flight correlation demonstrates that predictions were perfectly in line with flight data's.

In addition, one dimensional models are currently used by Thales Alenia Space to predict the global chain "Solar Array Drive Mechanism and Solar Array Wing" coupled behaviours.

Recently, Thales Alenia Space had to face a new challenge for "Telecom Constellation" Solar Array. In order to obtain an optimized power generation at system level, it was necessary to develop, for the first time in Europe, a "two rotation axis Solar Array.

The goal was not only to specify as usual the characteristics of the deployment mechanism and to assess the reliability of the deployment, but also, for the first time, to verify if this new type of architecture is compatible with AOCS constrains.

It was necessary to develop a new tool based on a combination of the experience gained in the past in multibody analysis for solar array deployments and in one-dimensional analysis for Solar Array Drive Mechanism behaviour.

The presentation will show how this new tool has permitted to realize the combinations of three functional aspects which are deployment, tilt, and drive mechanisms for the Solar Array Sub System.

In addition, the presentation will show that the accuracy of the predictions has allowed to give input data's for the system study in order to validate that the Solar Array movement's are compatible with AOCS with regard to exported torques for example.

Partial correlation with ground tests have also been performed in order to validate the global model.