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

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THALES ALENIA SPACE FLIGHT HERITAGE IN DEPLOYMENT PREDICTION OF LARGE DEPLOYABLE STRUCTURES

Abstract

This paper deals with the correlation of the deployment prediction of the latest version of Thales Alenia Space High Power 7 panels Solar Array called SOLARBUSTM, the largest solar array ever built and deployed in orbit on Geo spacecraft. Kinematic Model will be described and accessible flight datas available on Thales Alenia Space GEO telecom spacecraft will be shown. This paper will also underline how, based on reliable predictions, it is possible to secure the development of next generation large deployable structures thanks the lesson learnt in fligh and the use of so called "flight proven tools".

The deployment of solar array is a critical phase in the satellite phase, as a failed deployment may lead to the mission lost or to a drastic reduction of the satellite lifetime, while a poorly controlled deployment a may lead to destructive shocks and damaging of wings components. Moreover, the solar array deployment is one of the only sequence that can't be tested on ground. The tests that are performed in clean rooms are only functional tests, because, unfortunately, the zeroG systems necessary to compensate gravity bring to many perturbations to allow a representative deployment in terms of dynamics. In addition, it is impossible to deploy on ground large structures deployable in two directions.

That's why Thales Alenia Space has focused, since more than ten years, on the development of prediction models able to anticipate the solar array deployment dynamics, and, consequently, to evaluate the loads and shocks levels on the wing components.

The first prediction model was dedicated to the calculation of SOLARBUSTM four panels solar arrays. The second one was done for the six panels version of SOLARBUSTM solar array. Some of the first launched satellites gave the opportunity to correlate both models. The precision obtained was rather good, and gave confidence to continue with the development of new design solar arrays, with even more complicate structures.

Finally, while the latest and largest version of SOLARBUSTM solar array was developped (7 panels), a related prediction model was elaborated. Here again, the correlation with data from a recent flight gives satisfaction.

In conclusion, the capacity to perform accurate predictions gives us the capability to bring more maturity in order to secure the development of complex large architectures which are foressen for large antennas , solar array's, optical baffles and other large deployables structures needed for the next generation spacecraft.