Paper ID: 71109
student

29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

Author: Ms. Uxía García Luis
University of Vigo, Spain, uxia.garcia.luis@uvigo.es

Dr. Alejandro Gomez-San-Juan
Universidad de Vigo, Spain, alejandromanuel.gomez@uvigo.es
Prof. Fermin Navarro-Medina
University of Vigo, Spain, fermin.navarro.medina@uvigo.es
Prof. Fernando Aguado Agelet
University of Vigo, Spain, faguado@uvigo.es
Dr. Carlos Ulloa
University of Vigo, Spain, carlos.ulloa@uvigo.es
Dr. Guillermo Rey-Gonzalez
University of Vigo, Spain, guillermo.rey@uvigo.es
Mr. Pedro Orgeira-Crespo
Universidad de Vigo, Spain, porgeira@uvigo.es
Mr. Alejandro Camanzo-Mariño
Universidad de Vigo, Spain, camanzo.marino.alejandro@uvigo.es
Mr. Vlad Dragos Darau
University of Vigo, Spain, vlad.darau@space.uvigo.es

STOP ANALYSIS OF SMALL ASTRONOMICAL SATELLITE PAYLOADS

Abstract

As it is widely known, nowadays we are experimenting a revolution of the small satellite sector. Their smaller size and the possibility of using COTS components draws their cost to levels that opens space for a whole new set of actors, and that is happening across all fields. One of the fields that can benefit from this is astrophysical research. It requires, among other things, a very high precision pointing and tracking. While these small satellites typically offer acceptable pointing and tracking capabilities for Earth observation, they lack precision for astrophysical applications.

One of the main challenges when confronting this problem is to find a solution to correct the disturbances associated with thermo-elastic deformations, which are also undetectable in flight by inducing misalignments between the tracking system and the telescope. The complete thermo-elastic analysis (STOP = Structural Thermal Optical Performance) is a complex discipline because it combines three different fields that use three different mathematical models and languages. This gives rise to an infinity of partial approaches to the problem, that lead to internal communication problems and inefficient processes. STOP analysis intends to solve them using a unified methodology. This analysis method is typically performed in larger budget projects. In the case of smaller (i.e. cheaper) satellites, mathematical modelling is often overlooked or, in the best case, it is performed in a multi-physics software packages that has flaws in one or more of these fields.

The aim of this paper is to show, for the case of a generic small satellite astronomical payload, an analysis methodology that integrates the entire STOP process using the analysis tools typically required by the European Space Agency: ESATAN for thermal analysis, NASTRAN for thermo-elastic deformation and Zemax Optics-Studio for optics.