Interactive Presentations (IP)
Topic 7 - Interactive Presentations (7)

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3D-PRINTING AND TOPOLOGICAL OPTIMIZATION FOR STRUCTURAL PARTS OF THE ROBUSTA-3A NANOSATELLITE

Abstract

Since the last decade, the nanosatellite's development has quickly increased, offering an easier and cheaper access to space for small payloads and reduced cost demonstrators. This economic system appeals lots of scientific projects including university students and experts all over the world but also private and governmental institutions for future space missions.

Gathering space specialists and students to build *CubeSat* is the purpose of the CSU-Montpellier in France that already succeeded 1U nanosatellite launches. Its next step is the development of a 3U *CubeSat* mission called *Robusta-3A* (R3A), foreseen to be launched in 2020 to collect and reemit meteorological data in order to **improve weather forecast in Mediterranean Sea** and mitigate seasonal flood incident.

Currently in the detailed design phase of the R3A's mission, my project focused on **3D printing** and **topological optimization methods** to upgrade the existing design of the ADCS structures and **explore new metallic/polymer concepts**. The objectives of this RD project are numerous: cost mass reduction, similar or strengthened mechanical behavior, easier manufacturing and AIT processes by limiting for instance the number of interfaces of this complex assembly.

This project completed my Advanced Master training on space systems and required different engineering skills such as conception and mechanical/analysis understanding. The final results are several optimized conceptual designs and an ALM prototype made of polymer powder, in addition to the definition of some guidelines for future assembly optimization at CSU-Montpellier.

During the *GLEX2020* event, I would like to present some of my optimization results and parameter definitions. I would introduce the optimization purpose and an overview of its process to obtain the different designs: the constraints identification, the topological optimization method and its implementation on *Inspire/Optistruct* with the design iterations needed to obtain a realistic model by fitting geometrical/optimization parameters (objective function, constraints, boundary conditions, non-design space minimal thickness, etc.).

To conclude, I would present the next steps of future optimization project for improved 3D-printed prototypes and maybe after its practical use for small nanosatellite parts on a *CubeSat* mission if tests are successful enough.