

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IP)

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SMALL ROCKETS DESIGN USING ADDITIVE MANUFACTURING: AN EDUCATIONAL  
APPROACH.

**Abstract**

Today in Mexico, there are many students, young professionals, and enthusiastic people that who design and build small rockets for hobby and learning. So much so, that there are already national contests focused on its launching, even there are courses for educational purposes to develop them.

However traditional amateur rockets manufacturing is not cheap, and, usually, it is very difficult to get some components. Because of the inexistence of a specific part and the complexity of the working method to make them in our country.

Nowadays, 3D printing technology hand in hand to the knowledge of Additive Manufacturing play an important role in applications to the aerospace industry. In the case of rockets, it has a fundamental advantage: to decrease the production of components, reducing the use of materials and manufacture processes. As a result, building and launching costs decrease.

In Mexico, in the last ten years, many companies have a 3D printer due to the low price to acquire one of them. Our enterprise called Hadron Projects has experience in additive manufacturing. That is why, we want to focus on projects in the aerospace sector in the researching low-cost development of rockets.

So, in this paper we propose a course to educational purposes for modeling and manufacturing rockets using 3D printing techniques. The workshop is aimed to students, professionals, and enthusiasts. The specific goal of Hadron Projects Course is to create a small 3D printed rocket capable of accomplish the requirements of a space mission.

First, a study of some small rockets that already were launched is carried out to propose a rocket model. Second, a design rocket using drawing CAD (Computer-Aided Design) software was made to specify its weight, dimensions, geometry, number of stages, and type of fuel. Third, a structural analysis using numerical CAE (Computer-Aided Engineering) software technologies was carried out to define the conceptual design. Finally, the 3D model was printed.

In general, the purpose of the workshop is teaching, in an innovative, simple, and accessible way, how to design and build a rocket using additive manufacturing technology. To the next work, we'll focus in the aerodynamical study to the 3D printing rocket for being launched and to carry a determined payload to a certain altitude.