

## Simulation and Design of an Aerospace Mission Powered by “Candy” Type Fuel Engines

**Authors :** N. Hernández Huertas, F. Rojas Mora

**Abstract :** Sounding rockets are aerospace vehicles that were developed in the mid-20th century, and since then numerous investigations have been executed with the aim of innovate in this type of technology. However, the costs associated to the production of this type of technology are usually quite high, and therefore the challenge that exists today is to be able to reduce them. In this way, the main objective of this document is to present the design process of a Colombian aerospace mission capable to reach the thermosphere using low-cost “Candy” type solid fuel engines. This mission is the latest development of the Uniandes Aerospace Project (PUA for its Spanish acronym), which is an undergraduate and postgraduate research group at Universidad de los Andes (Bogotá, Colombia), dedicated to incurring in this type of technology. In this way, the investigations that have been carried out on Candy-type solid fuel, which is a compound of potassium nitrate and sorbitol, have allowed the production of engines powerful enough to reach space, and which represents a unique technological advance in Latin America and an important development in experimental rocketry. In this way, following the engineering iterative design methodology was possible to design a 2-stage sounding rocket with 1 solid fuel engine in each one, which was then simulated in RockSim V9.0 software and reached an apogee of approximately 150 km above sea level. Similarly, a speed equal to 5 Mach was obtained, which after performing a finite element analysis, it was shown that the rocket is strong enough to be able to withstand such speeds. Under these premises, it was demonstrated that it is possible to build a high-power aerospace mission at low cost, using Candy-type solid fuel engines. For this reason, the feasibility of carrying out similar missions clearly depends on the ability to replicate the engines in the best way, since as mentioned above, the design of the rocket is adequate to reach supersonic speeds and reach space. Consequently, with a team of at least 3 members, the mission can be obtained in less than 3 months. Therefore, when publishing this project, it is intended to be a reference for future research in this field and benefit the industry.

**Keywords :** aerospace missions, Candy type solid propellant engines, design of solid rockets, experimental rocketry, low costs missions

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