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STRUCTURAL DESIGN AND NUMERICAL SIMULATION OF A CUBESAT NANOSATELLITE

Abstract

In the recent years an increase has been observed in the generation of Nanosatellites developed by diverse universities about the world. The new technologies make the development of small satellites more feasible and to a low cost. The CubeSat is a miniaturized standardization of a satellite in the category of the nanosatellites which measurements of length, wide and long sound of 10 cm x 10 cm x 10 cm and an entire weight not bigger than 1.33 kg. The philosophy CubeSat differs from the big projects satelitales, for his low cost in his development, assemble and construction there are needed neither special places nor teams of high technology. At present investigations have been realized in the structural design of small satellites, in order to limit the size of the big satellites to minor dimensions, and this way to reduce structural and, mass therefore, costs derived from the throwing of these satellites, since to put in orbit a satellite has very high costs that it goes according to the structural mass, that is to say, to major mass of a satellite, the costs for his throwing and putting in orbit in the space are major, happening the opposite if the mass of the satellite diminishes, in addition to the costs raised to manufacture the structure. With base in the previous thing, in this work guy CubeSat proposes the design of a structure for a nanosatellite 1U, with a small number of structural components, with the principal target to reduce or to equal the mass; although it is known that structures exist for commercial nanosatellites designed exclusively for specific missions, from what any change that is realized in the structure will change the mechanical response for which was designed. The previous thing involves limitations in the mission planned for a spatial specific program, in which they are needed from structures with requests and particular specifications. Also, the ignorance of the environments of throwing of a nanosatellite, it provokes that many missions fail after realizing tests of integration with charges in mechanical-spatial conditions. From what it is necessary, that these structures obtain the mechanical appropriate qualification, so that they are suitable for the integration satelital and the conditions of throwing in accordance with the international standard Cubesat. Therefore a new structural design of a satellite CubeSat that expires with the geometric characteristics of weight and size in accordance with the international standard of Cubesat, will allow to validate that the structure can remain complete in his components and tolerances of distortion caused by the static and dynamic charges in the critical phase of throwing. To achieve such targets, the software SolidWorks will be used for the structural design in 3D and for the Numerical Simulation Ansys Multiphysics, using the theory of Finite Element that determines the distortions and the efforts that the proposed nanosatellite will experience, in order to evaluate his structural resistance on having been submitted to charges generated by the high acceleration of the vehicle of throwing during the phase of blast-off. It will appear by means of the results obtained for the elongations and efforts of Von Mises, if the proposed structure is suitable or not to resist the efforts to which the structure will find submitted.