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STRUCTURAL DYNAMIC ANALYSIS OF A NANOSATELLITE LAUNCH PLATFORM

Abstract

In the last decade the satellite market has seen an increase of nanosatellites missions. To satisfy the growing request for nanosatellites launch services, GAUSS Srl has designed a launch platform to deploy in orbit daughter satellites. Two missions have been already successfully performed in the last three years, allowing the deployment in orbit of the first four PocketQubes ever and of eight CubeSats. Recently, the main platform structure has been updated in order to include more deploying mechanisms and to offer services to different shaped satellites such as CubeSats, TubeSats, PocketQubes and, at the same time, to optimize the satellite distribution mass. Such structure improvement passed through several dynamic analyses, essential requirement to guarantee the optimization and the efficiency of the satellite design. In the case of GAUSS Platform, the analysis was not limited to the satellite bus alone but included the nanosatellites boarded inside the deployment mechanisms as well. For this reason, the natural frequencies were identified and analyzed taking into consideration both systems: platform and accommodated satellites. The finite element model developed in this work considers a sandwich panels structure made of two different materials: sandwich aluminum–aluminum and carbon fiber–aluminum. The model used for analyses and simulations is based on a FEM software and the dynamic loads adopted as input for the simulations are those established by launch provider. The paper gives an overview of platform design and structural modelling, showing the results achieved through the finite element method analyses and how they have guided the design in terms of dimensions and material selection. Particular attention is given to the analyses of normal frequencies and modal shapes related both to the main platform and to the deployment mechanisms boarded inside the carrier.