NUMERICAL SIMULATION OF IMPACT OVER AEROSPACE PROTECTION

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Summary. New ballistic protection systems have been created recently based on the newly developed high-tech materials. One of the industry’s objectives is to develop lighter and stronger defensive systems, which allow higher mobility and greater safety for both vehicles and humans. This work studies mathematically the behavior of an aerospace protection against a projectile impact, seeking an optimized geometric and structural construction. The Al-Qureshi et al model suggests a ceramic and metal layer system protection, and describes the projectile behavior and the impact absorption properties of the system. The literature shows, due to the considered parameters, the dependence of the erosion tax and the loss of velocity. The phenomenon is described in different steps, presenting particular effects for each. The equations of the behavior are not equal between the stages, presenting different system properties. The work presented here shows mathematical simulation performed on the solved model searching for best values for future studies. Among the properties to optimize, is the relation between the thicknesses of the used plates, deforming profile, density of ceramic, in addition to other relevant parameter. Knowledge of Maplesoft Maple programming allows the simulation of different parameters in the differential equations. As a result, graphs and surface plots were generated, which allow a deeper analysis of the model and builds an improved understanding of the process of fracture in materials by high velocity impact.
Future studies will use these results as the basis for the manufacturing of a protection, which will be used for a practical experiment.