

Good morning

My name is Keidi Copca, and I would like to thank ACEX for the opportunity to present this work, entitled “**Numerical Impact Analysis of a Suborbital Platform for CubeSat Transportation**”

This study presents the structural analysis of a suborbital platform transported by high-altitude balloons. Suborbital missions are used to carry out scientific experiments in near-space conditions. During the recovery phase, it is common that the gondola impacts on the Earth’s surface. Depending on the impact orientation and velocity, structural damage and failures in the internal components may occur.

For this reason, the aim of this work was to evaluate the structural behaviour of different platform configurations under various impact conditions.

To carry out this study, three structural configurations were developed using CAD modelling. All models maintained the same overall dimensions, mass, and internal component distribution. The only variation was the external structural geometry.

Design 1 was developed using solid aluminium plates. Design 2 was built using extruded profiles. Finally, Design 3 was developed using L-shaped profiles.

All models were defined using 6061-T6 aluminium. The numerical simulations were performed in ANSYS using the Finite Element Method. First, a modal analysis was carried out to identify the natural frequencies of each design. Afterwards, impact simulations were performed considering different landing orientations. The different impact configurations are shown in Fig. 3.

Two impact velocities were also evaluated: 11.94 metres per second, corresponding to a nominal parachute-assisted condition, and 18 metres per second, corresponding to a critical condition caused by parachute failure.

The results showed differences in the structural behaviour of the designs. Graph 1 shows the maximum plastic deformation results. Design 1 exhibited the highest levels of plastic deformation, particularly in edge impacts. Design 2 showed intermediate behaviour and lower deformation in some scenarios. On the other hand, Design 3 presented a more uniform stress distribution under different impact conditions. However, in corner impacts, higher levels of plastic deformation were observed due to load concentration.

In addition, a similar behaviour trend was observed for both impact velocities. Nevertheless, as the velocity increased, stress and plastic deformation levels also increased in all designs.

In conclusion, the results showed that each structural configuration behaved differently depending on the impact condition. The structural geometry had a significant influence on the distribution of stress and deformation during impact. Higher impact velocities produced greater plastic deformation in all the evaluated configurations. These results may contribute to the development of safer suborbital platforms for future near-space missions.

Finally, I would like to thank you for your attention.

Thank you very much.