FINAL PROJECT

STUDY ON EFFECTIVENESS OF BUTTERFLY-LIKED METALLIC DAMPER (BLMD) IN ABSORBING DYNAMIC LOAD ENERGY BASED ON FINITE ELEMENT METHOD

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ABSTRACT

The landing gear of an unmanned aerial vehicle (UAV) is critical for ensuring safety and operational efficiency during take-off and landing. Excessive vibrations, caused by structural design, runway conditions, and dynamic interactions, can damage components and disrupt electrical systems. This study investigates the application of Butterfly-Like Metallic Dampers (BLMD) as passive vibration mitigation devices. BLMDs are designed to absorb and dissipate dynamic energy, reducing vibrations transmitted to the landing gear and enhancing stability and energy dissipation. In this final project, a comprehensive static and dynamic analysis is performed on the BLMD applied to the UAV nose landing gear. Using the finite element method, the effects of dimensional variations on stiffness, energy dissipation, and structural response were evaluated. A computational program was developed to analyze displacement and acceleration responses for different BLMD configurations. The methodology included defining BLMD geometry, performing static analysis to derive stiffness and energy dissipation, and conducting dynamic analysis on the landing gear system. The results from the static analysis showed that model S6 was the most effective BLMD in absorbing energy, achieving a stiffness of 15854.27 N/mm and energy dissipation of 15735.680 N.mm. The dynamic analysis revealed that the results show that model S6, with the highest stiffness, reduces maximum displacement by 33% compared to the base model (S1) but has the highest acceleration response. Conversely, model S7, with the lowest stiffness, reduces acceleration by 24.53% compared to S1 but results in higher displacement. These findings highlight a trade-off between stiffness and dynamic response, where higher stiffness decreases displacement but increases acceleration, while lower stiffness reduces acceleration but increases displacement.

Keywords : Landing Gear, Butterfly-Liked Metallic Damper (BLMD), Energy Dissipation