Master’s Thesis Defense Announcement
Mechanical and Aerospace Engineering Department
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Parametric Analysis of a Dynamic and Static Models for Low Velocity Impact of Specially Orthotropic Laminates

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Abstract
The high specific strength and specific stiffness of composite materials makes them highly desirable for structural applications, but their laminated nature makes them susceptible to impact damage. Even low velocity impacts (LVI), generally, result in barely visible impact damage (BVID) and delamination, which can go unnoticed and grow during service, eventually leading to catastrophic failure. Due to this, the study of impact resistance and damage tolerance is typically studied through LVI followed by compression after impact (CAI) experiments. However, conducting LVI experiments are time consuming and expensive, as they require specialized equipment and extensive pre-test preparations.

In this study, the possibility of using quasi-static indentation experiments to replace dynamic impact testing is explored for specially orthotropic laminates. Analytical models are used to compare the response of plates under quasi-static central point loads and dynamic impact loading. Quasi-static indentation is modeled using first order shear deformation theory (FSDT), whereas the dynamic impact is modeled using a non-linear two degree of freedom spring mass model. Parametric analyses were conducted to study the influence of aspect ratio, laminate plate stiffness, and impact energy on the range of feasibility for use of quasi-static indentation to replace dynamic impact tests.