

**NORTHERN ILLINOIS UNIVERSITY**

Carbon Fiber Monocoque Chassis Redesign

**A Capstone Submitted to the**

**University Honors Program**

**In Partial Fulfillment of the**

**Requirements of the Baccalaureate Degree**

**With Honors**

**Department Of**

Mechanical Engineering

**By**

Todd Durham

**DeKalb, Illinois**

Spring 2021

University Honors Program  
Capstone Faculty Approval Page

Capstone Title (print or type)

Carbon Fiber Monocoque Chassis Redesign

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Department of (print or type) \_\_Mechanical Engineering

Date of Approval (print or type) \_\_\_\_\_ 4/23/2021 \_\_\_\_\_

Date and Venue of Presentation \_\_4/23/21 – CEET Senior Design Demo Day\_\_\_\_\_

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## HONORS CAPSTONE ABSTRACT

The NIU Supermileage Team develops ultra-energy efficient gas and electric vehicles. In the past, the team has created their vehicle using an aluminum tubing frame and carbon fiber shell. The carbon fiber shell is not load bearing and only acts as an aerodynamic shape for the vehicle, allowing it to slice through the air efficiently by minimizing drag due to air resistance and turbulence in the form of eddy currents. The primary goal is to develop a monocoque chassis for the Supermileage Team. A monocoque chassis is a body type in which the vehicle is composed of a singular, unibody structure. Rather than having an aluminum tubing frame as the structure and carbon fiber shell as the aerodynamic geometry, the carbon fiber composite structure functions as both the load bearing structure as well the aerodynamic structure. This allows for optimization in weight, aerodynamics, and rolling resistance. The Supermileage Team requires a carbon fiber monocoque vehicle redesign that improves overall energy efficiency.