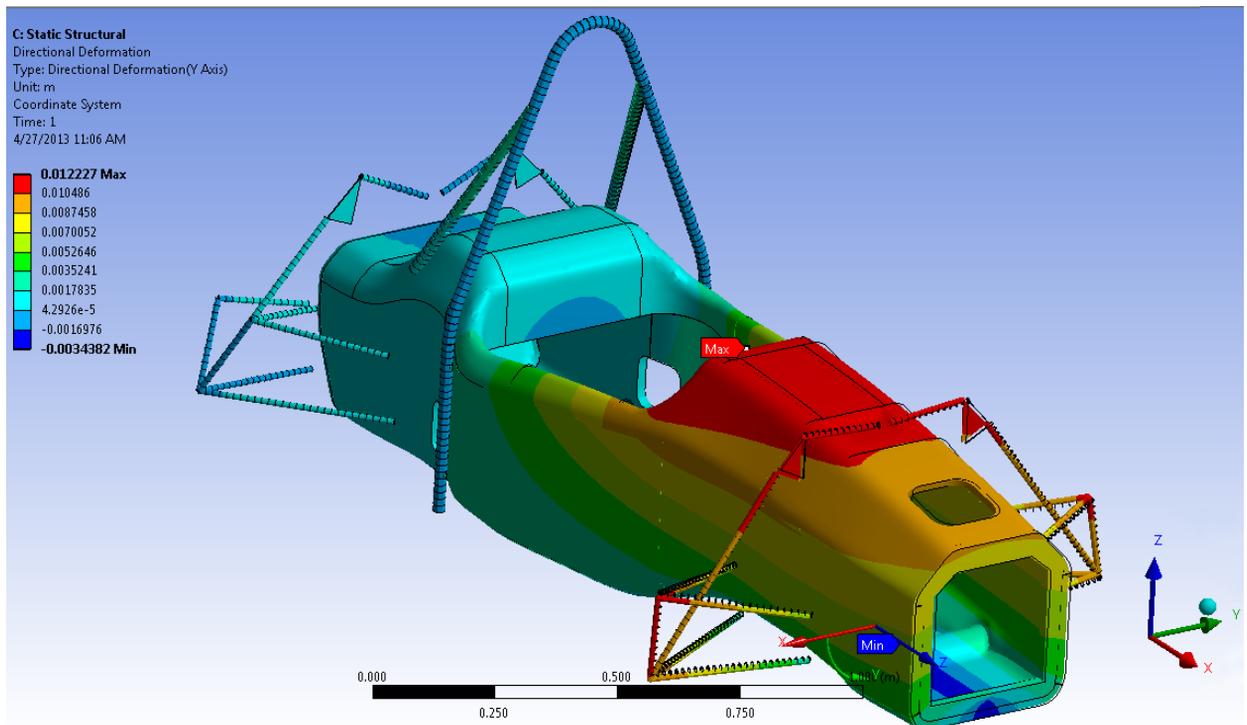# CORNELL FORMULA SAE

By *ANSYS Advantage* Staff

FEA shows that the race car monocoque meets torsional stiffness target.

Cornell Formula SAE is a group of undergraduate and graduate students who design, manufacture, test and race a formula-style, open-wheeled race car in the Formula SAE competition held every May in Brooklyn, Michigan. Cornell has been one of Formula SAE's top contenders, winning the world championship nine times and placing in the top 10 almost every year. For the 2013 competition, Cornell Racing created its first-ever ultra-lightweight carbon fiber full monocoque, which incorporates body and frame into one structural element. The monocoque comprises sandwich panels of carbon fiber-reinforced polymer with an aluminum honeycomb core. With these materials, the monocoque was responsible for a large part of the 35-pound weight reduction from the previous year's car. As a consequence, the monocoque chassis involved much greater complexity.

Student engineers optimized the design to achieve the conflicting goals of maximizing weight reduction while maximizing tortional stiffness as well as passing a three-point bending test required to prove equivalence to a baseline steel-tube frame vehicle, among other equivalence tests. Students created a CAD model of the overall monocoque geometry, then they used ANSYS DesignModeler to slice the design into panels and optimize for bending or torsional stiffness, depending on position. Cornell undergrads used ANSYS Composite PrepPost to evaluate dozens of possible designs by varying the composite ply material and the number and orientation of plies throughout the monocoque.

"With ANSYS Mechanical and Composite PrepPost, it was very easy to change every aspect of the stackup and view the effects on the overall structure, all the way down to the individual ply," says Alex Hsia, undergrad student at Cornell. ∧

Learning Experience

ANSYS and Cornell University have developed a unique collaboration that has flourished for well over a decade, helping to extend Cornell's reputation as one of the world's leading research institutions. ANSYS software is used by students and teachers in the classroom as well as by project teams and researchers to solve challenging mechanical and fluid-flow problems.

Reference
www.cornellfsae.com