



# CYCLONE RACING

Iowa State University Formula SAE

This year has been one of reconstruction at a team organization level, in addition to learning a lot of technical skills from the standpoint of designing a Formula SAE car. As our design stage draws nearer to completion we prepare and are excited for manufacturing to start



Team photo from the Formula North competition 2012

New components such as this year's suspension brings challenges as well as a lot of room to improve from last year. While retaining the same wheel and hub design as last year, the suspension has lost 15 lbs throughout the entire car without compromising stiffness and strength constraints by using a lightweight aluminum for several components or more efficient designs.



Derek Peters  
Junior | Mechanical  
Engineering |  
Technical Director

We also switched this year from a 439cc YFZ450 to a factory EFI-style 450cc YFZ450 engine. This entailed getting a newer engine, a laser scan of the engine so we could develop a more accurate CAD model, and redesigning the engine cradle. To prepare for this we machined a new 20mm restrictor and a smaller intake plenum for developing a baseline fuel and spark map on an older-style YFZ450 which should transfer easier to the new engine. In the Spring we'll have CFD analysis done for the new intake plenum and exhaust and have them manufactured and adjust the maps accordingly. The primary goal is consistency and reliability.



TJ Beavers  
Senior | Mechanical  
Engineering +  
Nuclear Engineering  
ISU SAE President |  
FPowertrain Systems  
Director



With the controls last year a lot of changes were executed such as a driver adjustable pedal tray, a hydraulic shifter, and a push-pull cable for the shifter. While most of the changes worked out very well there is always room for improvement. This year the pedal tray is being lightened and the mounting is being improved to lessen compliance. Also, a focus on CR-17 was the comfort of the driver, so this year's steering wheel will be utilizing molded grips to make for a more natural feel.

Aero is back! Jake Mazzio; the body/composites team leader, has been working hard doing CFD analysis on an undertray for CR-18. Last year we tried bonded panels for increasing chassis rigidity, but were met with numerous problems. The team is shifting back to composite body panels and in the Spring mold making will begin for the panels and under-tray. Additionally going back to composite body panels will allow for more complicated geometry making for better fitting components and better flow numbers through the radiator.



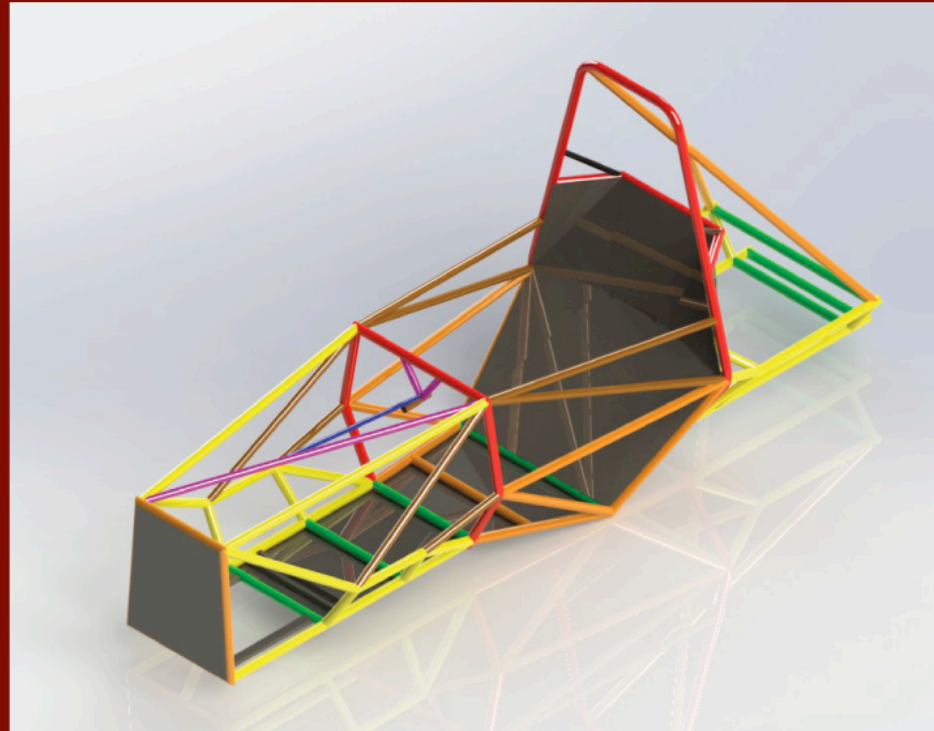
The brake pedal was the teams first component completed by team members as part of a class this year.

The goal of vehicle dynamics design for CR-18 has been to create a solid platform to build upon over the next several years. Through several analysis techniques, high level parameters of the vehicle were decided upon first, trickling down to the smaller details. The result is a 350 pound car goal, utilizing a 10" Hoosier R25B tire at the front and rear, with a 45% front weight distribution. The car will use Ohlin's dampers, centrally mounted for ease of adjustment, actuated using a pushrod independent suspension front and rear. Revised suspension kinematics, springs and anti-roll bars, along with anti-Ackermann steering will provide a very responsive, balanced, fast, and easy-to-drive race car.



Kevin Riley  
Senior | Mechanical  
Engineering  
| Vehicle Dynamics

This is the SolidWorks model of our completed chassis for CR-18. Tube color corresponds to different sizes and thickness of tubing.



The differential is slated to remain a Torsen style that we'll buy the internals for and machine the housing for from 7075 Aluminum. For CR-18 we plan on testing sealing the differential better to take advantage of oil for lubrication instead of grease. While the eccentric mounting of the final drive last year was innovative it was hard to implement. We are going back to the incantation of mounting which worked on CR-16.

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## Special Thanks

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