

CCS Students Learn to Balance Aerodynamic Design and Functionality

Chris Williams

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— Brandon Card
WTSI Engineer

CCS student Dan Nikonchik created a concept rendering as part of TARDEC’s FED Program, which engaged a team of transportation design students at CCS to help develop the interior and exterior features of vehicles under development. (Image courtesy of CCS.)

Most Army vehicles are engineered to perform a variety of specific functions based on operational and mission requirements. Historically, tasks that impact the vehicle’s shape, style and form traditionally have been signature management or ergonomic concerns. However, associates at the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) knew they had to take a novel

approach to designing the Fuel Efficient Ground Vehicle Demonstrator (FED) with an exterior shape that would minimize drag, improve aerodynamics and enhance fuel efficiency.

TARDEC and industry partner World Technical Services Inc. (WTSI) worked closely with transportation design students from the College for Creative Studies (CCS) in Detroit, MI, to design exteriors

for TARDEC’s ‘Monster Garage’ FED Bravo demonstrator.

“We always wanted to make a change, appearance-wise, in our approach to the demonstrator,” explained TARDEC Engineer Mohammed Mazhar. “Most military vehicles tend to be boxy, but aerodynamics is a major concern for this particular vehicle. As CCS has a lot of experience in automotive engineering, we

thought we should take advantage of what they had to offer.”

TARDEC FED Team Leader Carl Johnson commented that the organization’s partnership with CCS was a prime example of the Army using innovative and collaborative approaches to advance technology. “We’re looking for new and different ways to drive innovation to the Army. Besides style, industrial design can also help with packaging,

which plays a key role with fuel efficiency and aerodynamics. I think industrial designers are able to look at things a bit differently than engineers do,” Johnson stated. “The results were better than we could have anticipated, and I’m very impressed by the outcome. The students really stepped up and did some phenomenal work.”

The ‘Monster Garage’ team initially approached CCS Professor Mark

West about a possible collaboration in late 2009. The partnership with CCS provided an opportunity for students to participate in a project with real-world applications and challenges. “This project was unique because the students had to build something to be executed in full scale, which is very different than the work we normally do,” West remarked. “The value is that they get to work in a real-world scenario on a full-size vehicle. A real person is going to have to sit in and



TARDEC Director Dr. Grace Bochenek (left) observes CCS student Jake Bosnak as he works on a CAD 3-D rendering of his FED vehicle design during her visit to the school on April 1, 2010. TARDEC Associate Rachel Agusti (rear) looks on. (U.S. Army TARDEC photo by Elizabeth Carnegie.)

The project challenged students to consider functionality and work alongside engineers with very specific needs. "We went from doing whatever we wanted to fitting their criteria and making our design into their package. My design changed a lot because I'm limited in how flexible

I can get with the curves, seating of the passengers and various

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TARDEC Engineer

views and angles," remarked CCS student Fardos Abbas. "It was also a challenge to work with engineers, who think differently than we do. It's more of a real-world situation — we're actually getting a taste of it before we do it for any other company, which is exciting."

The students began with 2-dimensional (2-D) renderings, which were then developed into 3-D computer-assisted designs (CADs). Every few weeks, the 'Monster Garage' team would bring in new requirements, such as specific tires, engine sizes and transmission locations, for the vehicle. The students then revised their designs to incorporate these changes without sacrificing their initial concepts' originality.

"I like projects that are much more practical and give us a more realistic approach," stated student Jake Bosnak. "We have to think about what the engineers go through for a vehicle that will actually go into production. The engineers have been great, and it has been a challenge to make sure they're happy with what we're doing and that they understand what we're drawing, because a lot of engineers don't have much design familiarity. We have to be really descriptive and specific."

Mazhar remarked that he was impressed by the students' commitment

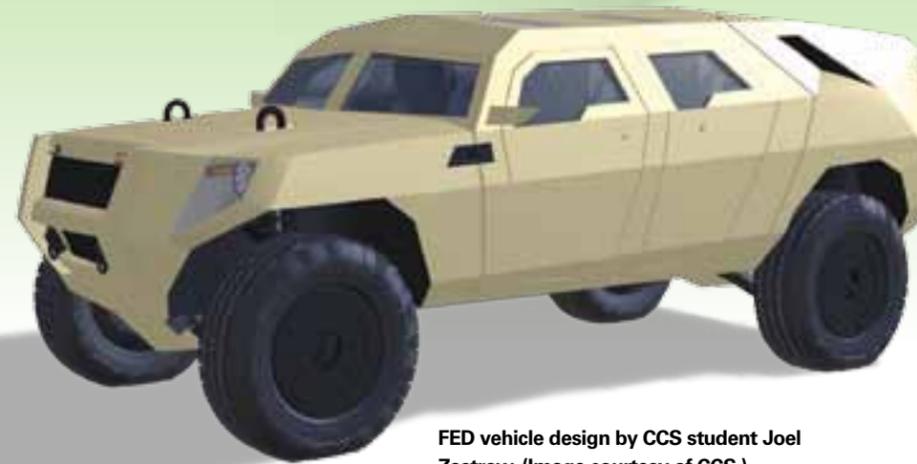
drive this vehicle and be able to use all of the interior components." To give students the freedom to design a unique and aerodynamic vehicle, engineers provided only a few key parameters and requirements at the outset. "Some of the ideas the students came up with were different than what we would normally see because they're not bound by engineering thinking, where it's function before anything else," remarked WTSI Engineer Brandon Card. "We gave the students a great deal of freedom at the beginning, and as the course went on, we began supplying more requirements so they had to go back and look at refining and changing their concepts."



Image courtesy of Ricardo plc.



FED vehicle design by CCS student Zack Stephanchick. (Image courtesy of CCS.)



FED vehicle design by CCS student Joel Zastrow. (Image courtesy of CCS.)

and responsiveness and that the project was beneficial to both the students and TARDEC. "If you look from the first sketch to what they have now, they have refined their concepts," he explained. "I learned from the students, who have a different design approach than we do at the Army, and they received knowledge of Army vehicles."

CCS student Joel Zastrow's design was chosen as the program's first-place finalist. Zastrow was brought onboard with WTSI over the summer to refine the concept and assist with interior and exterior designs. "I'm honored," Zastrow remarked. "I always enjoyed military vehicles as a kid, and it's an honor to be able to do this for my country."



CCS transportation design student Joel Zastrow (left) reviews his 2-D FED concept drawing with TARDEC Engineer Mohammed Mazhar. (U.S. Army TARDEC photo by Carrie Deming.)