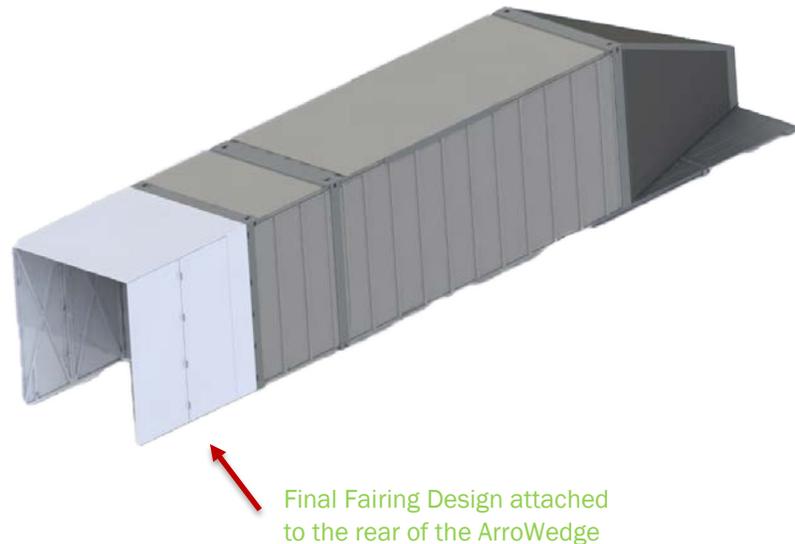


SPONSOR:

Union Pacific Railroad

ArroWedge Rear Fairing Extension

Union Pacific Railroad was first incorporated on July 1, 1862 with the first rails laid in Omaha, Nebraska. Since then it has grown to operate approximately 9,000 locomotives, manage 95,000 freight cars and employ over 50,000 people. In order to improve fuel efficiency of its fleet of freight trains, Union Pacific has sponsored our Capstone team of 5 mechanical engineering students to develop a rear fairing to attach to the back of a previous year's Capstone project called the ArroWedge. The role of the rear fairing is to help close the gap between intermodal cars immediately behind the ArroWedge, thus reducing the total drag on the train.



Final Fairing Design attached to the rear of the ArroWedge

The design process included wind tunnel testing, computational fluid dynamics, review of origami design and computer-aided design modeling. Through testing of different concepts, the team converged on an optimal design of a foldable rear fairing that extends approximately 8 feet beyond the ArroWedge. The selected design includes such features as a lightweight aluminum tubing frame and fiberglass siding. The fairing was also made to be collapsible for easy stowing when not in use.

Based on wind tunnel testing and computational fluid dynamics, the drag reduction of the entire train with the use of our rear fairing was shown to be about 3.7%. If implemented, this reduction will make a large impact on fuel consumption for the entire fleet and save around 0.175% in fuel consumption for Union Pacific. This translates to about \$200,000 in fuel savings per year.

YEAR

2016-17

TEAM

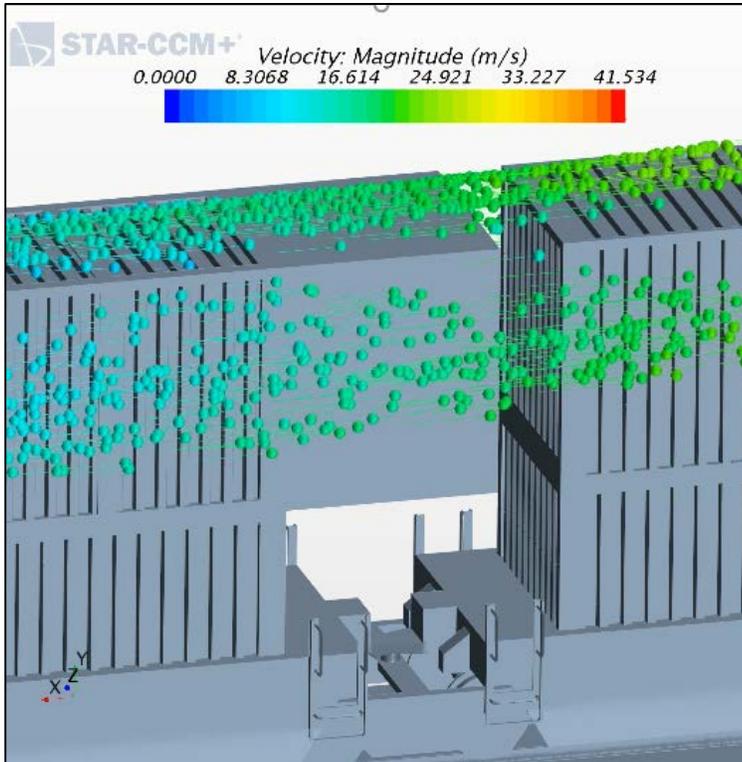
25: FlowModal

COACH

Richard Gee

STUDENTS

Jarom Hatch, Brandon Burkhart, Brandon Hunsaker,
Preston Elmer, Jordan Rapp



Star CCM+ Simulation of Rear Fairing. Spheres indicate air particles passing over the space between two intermodal cars. The space is greatly reduced by the added fairing



Wind Tunnel Testing of full train including the Ar-roWedge and the rear fairing attachment.