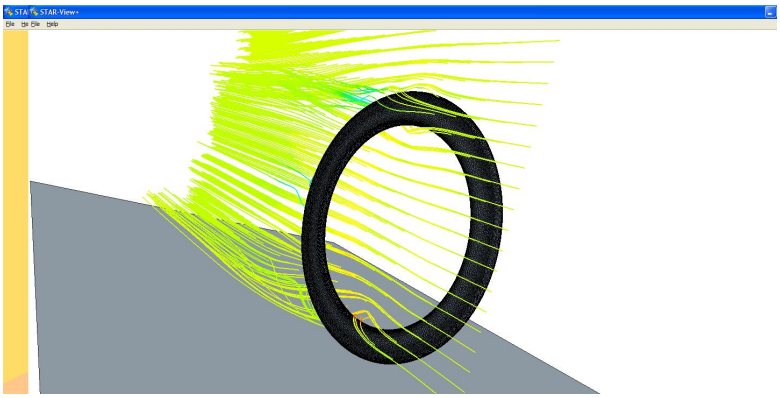
Flo Cycling Releases Computer Modeling Images

On November 12, 2010, in Product Reviews, by Cody

Over the last 3 weeks, I've been keeping tabs on the brothers at Flo Cycling (Jon and Chris). Chris just finished up his triathlon season with a late race in Arizona. Congrats to him and Jon on another great season. Along with racing, the brothers have gotten some exciting initial results from their aerodynamic modeling (Official release of images and data here).

First and foremost, models show negative drag at 15 degrees of yaw. Below, Jon will help explain what that means, but in general these results are competitive with the big boys in the market. The below picture (there are more on their blog) shows the modeled airflow through CD Adapco software. The actual results will come from the wind tunnel but this process allows for cost efficient designing so that they don't have to spend more time ($) in the wind tunnel than they have to.

Here's my favorite picture.



Velocity Stream for Flo Cycling Fairings

The above picture shows modeled air flow coming at the wheel from an angle and bending around the fairing and exiting the rear. What intrigues me the most was the air disturbance *in front of* the wheel/fairings. I honestly don't understand the physics but am trying to find answers.

After exchanging emails, Jon answered some questions about what it all means and where they are in the process. Check out what he had to say!

Jon wanted me to preface the dialogue with this statement

> "The information below is a basic description of what we are looking for. There are many other elements that go into building and designing wheels."

What can you extract from these pictures? How do these visual results/pictures compare to the larger brands or is it more of a "only a trained eye" can evaluate it?

> The pictures along with the results tell the true story. The pictures help visually represent what has been calculated. There are a few things that we are paying close attention to when looking at the pictures. First the vector models show us what direction the air travels after it comes in contact with the wheel. Most of the drag is a result of dirty air going through the spokes. If we can reduce the amount of air that travels through the spoke we reduce the drag. The shapes of the fairing play a large roll in the direction the air travels.

The second thing we pay close attention to are the pressure files which show areas of high and low pressure. At any yaw angle other than 0 degrees you have two leading edges. The first leading edge is where the air meets the tire at the front half of the wheel. The second leading edge is where the air meets the fairing at the back half of the wheel. Most of the new studies in wheel aerodynamics have been focused on what the designer can control. Since we cannot control the leading edge created by the tire we focus on the leading edge created by the shape of the fairing at the back half of the wheel. This is why Zipp, Hed and Reynolds are moving to a wider toroidal shape. The wider shapes are similar to an airplane wing at the leading edge. The negative drag which people talk about comes from the resultant of the high and low pressure areas on the shape. A trained eye can get a good idea of what is happening but the computed results tell the true story.

The larger brands do use CFD modeling and I believe most use CD-Adapco software. This is the same software we are using. I have seen results from the new Firecrest shape and they are showing similar data. Remember the CFD is really a way to test concepts. If you had to open a mold every time you came up with an idea, and schedule time in the wind tunnel you would need deep pockets and lots of time. The software streamlines the design process and allows you to optimize your shapes before you open a mold. The real numbers come from the wind tunnel. It is common to see only the tire, rim, and fairing modeled in CFD software.

What excites you about these pictures? The results, the engineer inside of you, or the fruition of a project? What goals did you have going into the testing? What results will qualify as a "success" for you and your brother?

Like any idea it continues to change as time goes on. Over a year ago we thought we could offer an affordable race wheel and it became a goal. At the time we planned on creating fairings made of ABS plastic. As we got into it we realized that we could hit the price points we wanted with a full carbon fairing. We knew we didn't want to use an open V-Notch mold and slap our logo on it so the next step was component selection and fairing design. As we studied shapes and wheel aero dynamics we realized we could develop shapes at the forefront of wheel aerodynamics. The next logical step was to test what we felt would make a good faring shape. The results and pictures verify that we were right. The numbers from the CFD modeling prove that the product is headed in the right direction. That direction is creating advanced shapes that are really aerodynamic at affordable prices. This is what really excites Chris and I.

Our goal going into testing was that our shape design would deliver great results. Based on our numbers I can say that we have achieved our goal at this stage of the project. The real test is in the wind tunnel. This will determine if we really accomplish our goal.

- Jon(at)Flocycling.com

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I am an amateur triathlete and analyst for a commercial bank. This blog will be a guide through the lessons I've learned and adventures I've had in the world of multi-sport.

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