The Reality Of Aero

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Sunday, 12 October 2008
Last Updated Sunday, 12 October 2008

In the world of triathlon, it's all the rage.

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Got aero?

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It is a big trend in the triathlon community - the perceived benefits of aero tubing, aero helmets, aero bottle holders - you name it, aero is where it's at these days. Whether it's a more aerodynamic frame, or more aerodynamic bike fit/position, or a more aerodynamic helmet, "aero" is a huge catch phrase in the triathlon world. This focus on aero was once again brought to my attention at the Longhorn 70.3 half Ironman last weekend. As I was there supporting a number of athletes that were competing, I witnessed a lot of aero frames and helmets (or "coneheads" as one of my athletes calls them). In some ways, these struck me as frightening trends in that there is obviously a lot of talk and marketing dollars going into some of the beliefs held by triathletes these days.

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And much of it revolves around the supposed benefits of aero on the cycling segment of the race.

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As luck and life would have it, I did a lot of research into aerodynamics when I was in the latter part of my high school years. At that time, back in the day, I had considered going into automotive design and aerodynamics research was going to be a big part of that. Along with that was a developing passion for the technology and design of Formula One racing cars. When I was considering my future as a designer/engineer, I had contacted a number of people in the field including the faculty of the University of Maryland's Department of Aerospace Engineering .

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As I look back on what I learned about fluid mechanics back in those days, I find myself pondering some rather stunning points of contention.

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First (and probably foremost) is the undisputed evidence (remember, this is from the fluid mechanics world, not the triathlon coaches and marketing gurus) that any significant aerodynamic benefits will only occur once the "vehicle" is averaging 22 to 25 mph. Now, last I looked, that is a VERY small percentage of triathletes.

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The primary factor that will affect aerodynamic drag is frontal area - or how much area is exposed to the wind as you move through the air. A good road position is going to not only be comfortable and provide good power output, it's also going to have similar drag characteristics to a basic aero position given that the frontal area remains fairly similar. Once we get past the issue of frontal area, the biggest challlenge is the rotating front wheel.
There is so much "dirty air" and turbulence created by the front wheel that it is hard to establish decent flow around the rider or any other part of the bike, It's hard to envision a little aero tubing helping someone riding at 18 mph because the aero experts would be concerned about the significant degree of turbulence created by the two rotating wheels.

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The "aero benefits" also assume one significant thing - that the air is flowing directly from the front. Sure, you may have a bit of a cleaner airflow around your head with that fancy helmet on, but what happens when the wind shifts slightly, or you turn your head to grab something out of your rear bottle holders, or you look down to grab something out of your Bento box? Voila - you have now just become a sail!!! Kiss that airflow goodbye, welcome more drag to your world, and enjoy the effects of it.

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The final point I would like to make is the effect of airflow (or lack thereof) on heating and cooling. If there is one thing that is critical in an endurance sport, it is maintaining homeostasis and core temperature. If the operating temperature of the body becomes elevated too much, then it requires far more cooling. There is a small window of operating temperatures. Using a helmet that limits the cooling effect of airflow even more is going to have some degree of negative effect. Again, the question is whether the benefits outweight the costs.

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Now don't get me wrong, there are, without a doubt, aerodynamic benefits to be had while cycling. Of that there is no doubt. For example, we all know it's easier to ride behind someone, to be pulled by another rider, than it is to lead. Drafting makes life a lot easier - for cyclists and NASCAR drivers!
If you look at the science of aerodynamics and fluid mechanics for the greatest percentage of triathletes, you'll find that there is minimal benefit but a potentially greater cost. In many ways, you're better off using the good old fashioned "hard work" to build your power. Get a bike fit that optimizes biomechanical comfort without sacrificing power output. Then, remove some weight from the bike - primarily rotating weight, then frame/component weight. Those things will have a huge impact on your time. Once you are averaging 22 to 25 mph, then we should be having the aero discussion and realizing the benefits of the aero helmet or the aero tubing. For the average triathlete moving along at under 20 mph, the benefit-to-cost ratio just isn't in their favor - over and above the cost of a good bike fit (which, to me, is a given).

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It's fascinating to me how the cycling industry (as compared to the triathlon world) just doesn't seem to have much focus on aero. So why is "aero" all the rage in the triathlon community? Let's face it - when Ironman writes in their Athlete Guide that the median income in their demographic is $160,000 (yes, those numbers are correct - circa summer 2008), then you realize that there are a lot of dollars that are being spent in the triathlon world on the latest and greatest. But let's face it - based on the information presented, most people would benefit far more from "building the engine" than in spending $170+ on an aero helmet.

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