To go deep…that is the question!

Triathletes (especially middle and long distance) tend to get fixated about bike courses and wheel choices. For example, IM Wales is very hilly so should you consider low profile (light as possible) wheels or go deeper…. 808 or even Disc?

A really nice article (with some edits) from Dave Ripley, who runs 51 Speedshop Indianapolis, side stepping the subjective matter to provide a definitive answer…. read on….

When should a triathlete choose weight over aero in regard to their race day bike setup? The short answer is NEVER. This may cause some eyebrows to raise, but let's consider the science and data. All based on the assumption that you are using aero equipment and light weight components. Basically, the question is, "should I run an 808/disc for aero or 303/404 to save weight because the course is hilly?"
When an athlete is attempting to power their bike towards T2, it is one big rolling physics experiment. Notice the reference to power. Power, recognized as wattage in cycling, is a calculation using torque, the angular velocity of your crank and chain-ring and your rolling speed. As you are physically applying torque to the pedals, there are several energy thieves trying to steal that velocity away. Most notably those little devils are gravity, friction (both the road and the drivetrain) and wind resistance. I will break them down and show you where each fall in order of importance, thus helping you understand what to prioritize when setting up our bike.

As you are spinning along on your bike, let's say at a constant speed of 16 mph, with a slight headwind of 10 mph, on a flat road, and you are applying a specific amount of torque onto the pedals. As that is occurring, there is friction resulting from your drivetrain as all of those metal components spin, mesh and release. I will assume that your drivetrain is in good repair and well maintained and thus resulting in the least amount of friction possible. It is still friction that costs energy that does not result in speed. But this friction is relatively constant even as you increase your effort and speed. So, we are not going to worry too much about drivetrain losses, just note that it is a small percentage of total loss.

Next is road friction, commonly referred to as rolling resistance. This also does not significantly increase as speed increases, but also adds to the total drain on your system. The most important thing to note here is that you should have "good" tires and either good inner tubes or a good glue job as it applies. You can either cost or save yourself a measurable amount of power by paying attention to rolling resistance, but that is information for another article. The takeaway is that we now have identified two of the energy grabbers, caused by friction losses.

Next let's talk gravity. Here is where the debate between weight and aero begins, so pay attention. Remember that we are spinning at 16 mph on a flat road. You have a constant drain on your energy system coming from the force of gravity. Since gravity

will not increase on its own and thus would stay a constant drain on energy, the only way that it becomes relevant to the discussion is by tipping the road up, or increasing the gradient. At what point does the increase in gradient start to impact your energy requirement, beyond the constant? Simply put, as soon as it goes beyond flat. But, before we find that magic tipping point, let's talk about forward velocity, or speed. Remember, 16mph. That is not an arbitrary number. 16mph is, roughly, the point where your energy requirement becomes most heavily taxed by wind resistance. So, that old thought "I am not fast enough for aero equipment to matter" no longer applies beyond 16 mph because that is the point where wind resistance becomes the biggest culprit in trying to slow you down. As we increase velocity (speed) the power required to do so increases exponentially. The power required to go a certain speed is a factor of velocity squared. The power required from wind resistance to increase that speed is a factor of velocity cubed! Basically, saying that going faster requires power to increase on almost a vertical scale.

Ok, so what about gravity? Since gravity on its own does not increase, we artificially increase its force by tipping the road angle upward. Not until that gradient gets up to about 6.5%-7% and your speed slows does the force of gravity start to overcome wind resistance in terms of power requirement. So, let's apply that to triathlon. Which triathlon bike courses actually have climbs of this gradient? And, of those courses, how many of them are at this gradient for more than a couple percent of the overall length, while the remaining much larger percentage is flat, rolling or downhill, where aero is still most important? The answer is virtually none!

So, let's answer the question! When is weight more important than aero in triathlon? When should you opt for the shallow and lighter 303/404 wheels over the deeper and more energy efficient 808/disc? Only when the overall percentage of the course is at a gradient of 6.5%-7.0% (or higher) for a measurable percentage of the total length. Or almost NEVER! (barring the few exceptions like Alpe de Huez tri)

You will save far more energy over the length of the course by maximizing your aero profile and equipment than you will by saving a handful of grams. So, when planning your next race bike set up, maximize aero first, minimize weight second. You will have overall better energy management, and thus should see better bike and run splits as a result.

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