

The Answer is  
*Blowing in the Wind*

BY IAN OSBORNE



**FREE TIME ARE TWO WORDS THAT ARE KICKED AROUND THE BIKE LEG OF TRIATHLON CONSTANTLY AND THERE ARE ALL SORTS OF NEW GO FASTER PRODUCTS TO HELP TAKE ADVANTAGE OF THIS. INDIVIDUALLY THEY ALL CONTRIBUTE BUT MAKING THEM WORK IN HARMONY IS NOT AS SIMPLE AS IT MIGHT FIRST APPEAR. IT'S AN EXTREMELY DIFFICULT SCIENCE TO MASTER ON YOUR OWN BUT THERE'S A MAN WHO CAN HELP AND HIS NAME IS SIMON SMART.**

We went along to the Brawn F1 headquarters in Brackley, Northamptonshire to meet Smart and see what he could do for Blue bikes professional rider Rob Johnson. Inside the wire all is quiet, windows are mirrored so everything remains secret. Here we meet Smart and happen to see formula one star Jenson Button, who is an avid tri fan that uses the training to help with his F1 racing. He'd been there tweaking his position for the upcoming London Triathlon.

The former Honda site, which was saved from the dogs by Ross Brawn, has two wind tunnels and since the FIA has regulated the use of these facilities over the last year these don't see the use they once did. This is where Smart comes in. A former F1 aerodynamicist with the Red Bull F1 team Smart is a keen cyclist and time trial rider. It doesn't take a genius to work out what happened when a car wasn't in the tunnel and Smart found himself with a little time on his hands.

"I set up the business in April 2007, but actually started planning things and playing with bikes in wind tunnels in 2004. It took three years to put everything in place during my spare time, which is always the hardest part when you also have a demanding full time job as the aerodynamics team leader at Red Bull F1."

While working for Red Bull Smart got a call from former pro cyclist Lars Teutenberg, who is now one of the tech bods at Columbia Highroad, the team of uber sprinter Mark Cavendish. With this Smart turned his

back on F1 to start Velo Science and work on bike aerodynamics.

"I had been planning to start a business anyway, and it was hugely fortunate that I met Teutenberg. One day a colleague of mine from Red Bull F1 was in Germany on business and luckily for me wearing his garish Red Bull jacket. Lars tapped him on the shoulder at the airport and asked if he knew any aerodynamics experts at Red Bull that he could talk to about bikes. My colleague knew I had an interest in this area and that's how it started."

The match was perfect, especially since Teutenberg has an incredible aptitude for science and while not a trained engineer works at a high level and pioneered a considerable amount of the aero work carried out with SRM on the track. The two exchanged ideas for a couple of years and Teutenberg knew Smart was planning his own business but never believed he would be stupid enough to quit F1 for the bike industry.

"In 2007 Teutenberg invited me down to the Tour and fortuitously he went to work for T-Mobile just after I had started Velo Science. Bob Stapleton had just taken over the team, he is incredibly forward thinking and could see the virtues of long term technical development of products in a team. By placing Lars in the team as Technical Manager he created a unique structure with Velo Science acting as the R&D/design department."

Teutenberg and Stapleton went straight to Giant and said they





needed to design a new TT bike and think out of the box. When they suggested using a guy from F1 with no experience in the bike industry Giant thought everyone was crazy. After much debate they started the TT project in November 2007 and by March the following year had finished the final design. Their prototype bikes were an instant success gaining a world time trial champion, Tour de France podiums and numerous national titles.

“Giant didn’t interfere with the aerodynamic shape/external design of the bike, but gave me a huge amount of direction in everything else which ensured the bike could be manufactured and ultimately be turned into a product. Designing my first bike has been hugely satisfying and one year on it’s great to see it go into production, especially with people like Timo (Bracht) winning the European Ironman Championships.”

Blue’s Rob Johnson is a young upcoming British Ironman pro who came to the tunnel to see if Smart could save him some time. It’s interesting to note that his sponsors Blue are right behind the idea of the process of helping athletes to become faster. If you buy one of their top end bikes, not only will they help with a proper bike fit but offer a free wind tunnel session too.

Before we go into the tunnel let’s talk basic physics first. The power we use to make our bikes move forwards is used to overcome rolling resistance of the tyres and gravity when climbing, frictional losses through the drive

chain set up and wind resistance. It’s this wind resistance that really comes into play once speeds start to increase. Once you go above 40 kph 85% of your power – that’s a lot of watts – is used to overcome this.

“The average triathlete will generate around 2 kg of drag force at 40kph, which takes them around 220 watts to overcome. This increases to 3 kg when you hit 50kph. Most of this drag comes from the rider. In an unoptimised position up to 85% of this drag is caused by the rider. This can be reduced to about 70% with a good position, so you can see where we need to start when it comes to making riders faster. Triathletes are a little different to time trial riders because they have to run off the bike. So the position is less extreme and we tend to open the hips up.”

In the tunnel Johnson is pedalling away in his regular position so Smart can record the wattages against the aerodynamic drag figures. Aerodynamic drag is when the air particles hit the bike and body and slow you down. To reduce this slowing down the obvious way is by reducing the frontal area that takes the brunt of the force. That said it’s not that simple. Once the air starts to

flow over the body and bike it needs to do so smoothly and stay attached following the contours. If it doesn’t the air separates resulting in a suction of turbulent air that will pull you back and this is the drag. As you will have seen in both triathlon and time trial racing there are many different positions riders use to try and optimise their position to reduce drag. Some are conflicting and it’s not just about reducing frontal area.

**BY THE END OF THE SESSION SMART RECKONS THIS NEW POSITION WILL SAVE JOHNSON 10 SECONDS PER KILOMETRE. THIS MIGHT NOT SOUND LIKE MUCH BUT THAT’S SIX FREE MINUTES IN AN IRONMAN, WHICH IS A LOT AT THE SHARP END OF THE FIELD.**

“Once a triathlete is using tri bars the gains will come more from their body shape rather than simply frontal area. The riders shoulders, back, neck and arms form a unique set of surfaces. Only wind tunnel testing will determine what the optimum position is finding the ideal compromise between power, comfort and aerodynamic drag.”

Smart and his team play about with all the obvious things such as stack height on the stem, which they drop a little. Then they adjust the saddle height both down and back up as well moving the fore and aft of the seat. Each time they make an adjustment they record the data. If they don't see improvements the team move things back as necessary.

One of the less obvious adjustments Smart makes to Johnson's position is to make his tri bars wider. The reason for this is because he has large shoulders and it allows him to open his arms a little. This might sound odd when you think about the frontal area being so crucial but the reason is to allow Johnson more movement in his neck and get his head lower while lifting his chin. This offers a greater improvement than the loss of a slightly narrower frontal area.

Smart and his team continue to tweak the position in a long yet methodical process recording all the figures which are then number crunched by Smart's own Drag2Zero software. Often changes are only minor but with lots of small improvements time is saved for the same power. A change of helmet makes an improvement to our pro's figures too. This isn't because the replacement helmet is different or more aerodynamic than his present helmet, it's because of the way it fits and the way it directs the airflow. This is different from individual to individual and is extremely personal relative to the position in which you ride.

By the end of the session Smart reckons this new position will save

Johnson 10 seconds per kilometre. This might not sound like much but that's six free minutes in an Ironman, which is lot at the sharp end of the field. Naturally Johnson will need to go and practise riding his new position both relative to adjustments on the bike and the way in which he holds his body while pedalling.

This all might sound very pro and at £t400 per hour this isn't cheap, especially as a two hour session is recommended to get the most out of a session. When you step back and look at the improvements they were quite considerable even for our pro tester. For the riders at the top of their game who ride a top end bike with all the time saving components then this is the next step in gaining some time.

“When you take up Triathlon as a complete novice, spending money on aerodynamics will not have such an impact on your performance. However, once you start to go faster you can see what slows you down because at 40 kph a person with 2000 grams of drag will need about 220 watts to overcome the wind resistance. If you can reduce the wind resistance, you then have more energy for the run, or you can ride faster for the same power output.”

When you consider a new disc wheel could set you back around a grand suddenly a wind tunnel session which could potentially offer equal if not better improvements when it comes to time then it suddenly doesn't appear so expensive. Also it's worth noting that some companies shout about amazing wind tunnel figures for their products but these are often tested alone and not on a bike. This tends to skew the results and once on a bike improvements are not always what they might first appear. This will then differ from bike to bike. If you want the latest tech when it comes to bike position and get the true bike fit then this could be the answer. ▽





### BLUE BIKES WIND TUNNEL DEAL

With the full purchase of a Blue Triad or Triad SL (Sram Red or Dura Ace 7900 build) Blue will pay for a two hour wind tunnel aero fit with Drag-2-Zero at the Cranfield University Wind Tunnel (worth £490). If the rider would prefer the full Brawn experience the upgrade cost is £300. Purchasers of a Blue Triad SL frame only (released October 2009) Blue competition cycles will pay for 50% of the wind tunnel aero fitting with Drag-2-Zero at the Cranfield University wind tunnel.

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