



Steve Hed. He's the man whose last name (followed by that mysterious square period, or full stop as the Brits say) appears on products that grown men drool over. The man who in the past 20 years has emerged as the quietly-spoken Yoda of bicycle aerodynamics. If you want to go fast on a bike, this is the guy you call.

But as Steve took time to sit down and reflect on two decades of aerodynamic bicycle wheel and component design it emerges that the person who's hand we really should be shaking is maybe that of Annie Hed, his wife.

Or Francesco Moser for breaking the Hour Record on disc wheels. Or Steve's Dad who instilled in him a boyhood obsession with model airplane building. Or the person that hired him to build

working with composites and when Moser set the Hour Record using a disc wheel it just started things spinning and the realization that I can make a wheel like that: I have the material and I know how to do it."

He's not quite telling the full story. Why would a bike shop owner want to go from selling to manufacturing? One of Hed's customers, Annie McDonnell, was a pro triathlete - she had hit Hed up for \$100 to get her to Kona to race the Hawaii Ironman the year before - and Hed seemed fairly set on impressing her. "The desire to do it was two-fold as Annie was one of my customers and she was out racing and so I said "We'll make a disc wheel." Some guys would've just bought flowers but Steve decided to reinvent the wheel. Literally. Seems it was the right move on both fronts: a year later they were dating and starting their fledgling wheel business.

Apparently so. Minnesota where HED Cycling is based is characterized by it's long cold winters. The perfect training it seems for Steve's disc wheel odyssey. "So we made the mould ... grinding in the shape by hand. I think it took about three months to make the shape for the first wheel from just a piece of aluminum. Looking back it was an insane way to do it but I didn't know anything about machine shops and I didn't have the money to have a mold made so I had a piece of aluminum and basically hand-sanded the shape into it using the same equipment that they use to grind lens for telescopes. It was the perfect lenticular shape."

Of course, what better way to pass the long, cold winter months?

"Oh, it was nuts," Hed finally realises looking back. "I went to a place that sold stuff to grind telescope lenses. The lap has the same shape on it as you want and you put down your grit and you

Fortunately though the HED line now includes aero products to suit every situation and preference, helped not insignificantly by a quirky ruling in a then quirky arm of triathlon: the Hawaii Ironman. "At that time due to the windy nature of the bike course disc wheels were, and still are, banned at the Hawaii Ironman, which just happened to be Annie's favorite event.

Matter of factly Hed continues, "So then we had to basically turn our attention to a wheel that would be legal in Hawaii." The result described by Hed in gobsmacking simplicity was the CX - the first true deep rim, spoked aero wheel.

"Except for say a square or something," Hed explains with his knack for making the complex easily understood, "a round tube or tire is the worst aerodynamic shape there is, so the whole idea was to take the shape of the tire and add a fairing behind it." A truly simple



1984 -1987
Only product was disc wheels

1988
Speed belt (allowed rider to push more power by a tether strap from handlebars to around riders waste. Outlawed by the UCI

1989
New invention is Tails (behind the seat water bottle holders)

1989
New invention and patent on CX wheel (low spoked 60 mm deep carbon fibre front wheel)

1991
Shock stoppers (shock absorbers on elbow pads)

1992
Introduced the jet style wheel (faired carbon fibre wheel) in 60 mm depth

1993
Introduced 40 mm depth carbon fibre wheel

1993
Introduced 90mm depth carbon fibre wheel

1994
Introduced hed front molded UFO aero shaped waterbottle

Fibreglass water-skis in the early 1980's. Or Valerie Silk for banning disc wheels at the Hawaii Ironman.

By themselves these are all random, seemingly every day incidents. That they all converged in the mind of cycling enthusiast Steve Hed in the early to mid-80's is about as freaky and unlikely as someone winning say six Tours de France. Seemingly impossible yet somehow now in the history books.

"I had started working on a disc wheel in 1983 but the lightbulb kind of really went off for me when Moser set the Hour Record in 1984 using a disc wheel. I saw a connection between his record and the disc wheel and the material it was made out of and my experience with composites," explains Hed as he reflects back on his time as a bike rat-turned-shop owner in St. Paul, Minnesota. "Before I opened the shop," he continues, "I had worked for a company that made skateboard decks and Fibre glass water-skis. So I had been

The concept of disc wheels had been around for quite a long time but 20 years ago carbon Fibre was an esoteric aerospace material only just beginning to appear in a few high-end sports products. At the 1984 Olympics disc wheels swept most of the cycling medals but only a couple of companies made them and those wheels could set you back about \$6,000.

Annie McDonnell, now of course Annie Hed, Vice-President and the day-to-day general manager of HED Cycling, was still racing and as Steve Hed tells it he saw a day when athletes like Annie might lose races simply because they couldn't afford the equipment to be competitive. A situation that Hed took as a personal injustice. "I've always thought that equipment should be affordable: it's one thing to lose because you made the wrong equipment choice but not being able to make that choice in the first place, well, that was sort of driving me."

just keep moving it back and forth. And eventually it digs a hole in the aluminum. It was crazy."

"I had sold the shop. We had so much faith in this thing that we needed every bit of money we had to do it. So we got the molds made, I bought an old hydraulic press cheap from the water-ski place and we started making wheels." Just 50 discs that first year at a retail price of \$395 but with Annie riding them on Team Mizuno, and Hed lucking out that her teammate Scott Molina also wanted to ride them, demand rose quickly. "Molina at that time was the guy to beat," remembers Hed. "He was unbeatable with or without a disc and the next year we made 200 and still couldn't keep up with demand. In fact we've never been able to make enough disc wheels to this day."

idea but unbelievably one that no one had done before.

"The tire width was already set so we applied the common aerodynamic aspect ratio of 3:1. You take a 20 mm tire and times it by 3 and that's how we got a 60mm depth rim. It was really quite simple."

Maybe to Hed, the son of a pilot, who had spent his childhood immersed in the theory and practise of model airplane building. "You know you build a model aircraft wing and it has an aspect ratio and you know how to build struts to hold your wings and you have to put a shape to them and the idea was to put that shape behind the tire."



Plus much like today, Annie was still taking care of business as Steve continues: "That year, 1985, Annie won a race in Vermont and first prize was cash and a car. So we took the car straight to the bank and used it to get more money to invest in the business."

The advances and the lessons didn't stop at the deep rim as Hed soon realized. "Basically I patented the wrong thing," he says matter-of-factly. "I patented a shape and I should've patented a stiffness." The combination of the carbon and the rim depth gave the rim a phenomenal stiffness - hoop strength as Hed calls it - so strong that the wheel could be ridden with just 12 or 16 spokes. "It was really the Ironman Hawaii rules that drove the whole process of making a deep section wheel, just one of those quirky things."

Even though a disc wheel is the fastest wheel, the booming popularity of the Ironman on TV promoted the image of a deep

our Aero Bar, they can't get comfortable on ANY bars. They tilt, they twist, they do everything."

"I struggled a lot over developing the Aero Bar because a lot of people are doing them so it had to be an aero bar that was distinctly different, that I didn't feel that I was just creating a product just to put another product on the market. I think that's probably the way I look at all the products we develop: it can't be another piece of something pumped out of Taiwan that is basically the same as the next thing on the shelf. A HED product has to bring something to the market over and above what is already on offer."

So the passion is still there. Initially it was the passion to spend three months sanding a block of aluminum. Now it's the passion to keep reinventing the wheel. "That's hard," admits Hed. "But it's more fun now: working with Lance's F1 Consortium; watching him

change has been that consumer demand for carbon fibre has brought the price down so everyone's been able to benefit. Over the past 20 years carbon fibre has gone from being an exclusive aerospace government material into a sporting goods staple - whether it's tennis rackets or bicycle parts carbon fibre is available."

"But beware of impersonators: there's a risk when everybody jumps on board that they just pack the carbon fibre in there and as long as it weighs less than aluminum then its fine for them. They're not using the material to its best at all. Carbon fibre is a designer's dream. There's nothing out there that can deliver the same aerodynamic shapes and still have a weight that's acceptable. For the bicycle designer, from a manufacturing flexibility angle, carbon fibre is a material that you dream about."

So where does Hed dream that he'll take his carbon fibre designs.

integrated the brake levers in so aerodynamically that was better: just making small steps. Just like seat and chain stay shapes affect the performance of your rear wheel, different tires affect your wheel performance."

"That's what I'm looking toward: the process of integrating wheels, forks, brakes, and handlebars. The future is to try and integrate these parts on a bike so that they all work together in a more aerodynamically clean way. It's a bunch of work - our TT fuselage is kind of moving in that direction - when you get the handlebars and the wheels and everything on that bike it's a fast, nice-looking piece of equipment. I think it's a step closer than anyone else has gone."

Just like 20 years ago, Steve Hed is not afraid to go out on a limb: to try, to test, to dream about making the best there is. Our interview has been brief, a small peek into the mind of a guy who

1995
Introduced downhill carbon fibre and alloy 45 mm rim width

1996
Started recumbent style wheels in 17", 20" and 24" in carbon fibre

1998
Acquired the DuPont designed 3 spoke wheel

2000
Introduced HED alp wheel

2001
Invented aero front carbon handlebar

2002
Deep 3 spoke

2003
Clip on handlebars

2003
All carbon 3 spoke

2003
Introduced all carbon stinger lite wheel and V03 TT fuselage

2004
S bend extensions for handlebars and Project R1 Road frame set



section wheel front and rear. "It put the idea in everyone's head that that was the aerodynamic standard. A disc wheel is still faster. Now there's a whole range of sections but because of the aspect ratio you really have to get over 50 mm in depth otherwise you're spending a lot of money for very little gain."

Back to his tenet about affordability again. Hed has another, one that drives his design vision: "It has to be a product that gets people to the finish line faster." And it's not always the super-aero approach that garners that result.

"That can be accomplished in a whole bunch of ways," begins Hed. "The obvious approach is aerodynamics but it can also be weight or as we've found in our wind tunnel work, it can be comfort. Like our Aero Bar: that was designed because I knew a lot of people riding aero bars that lacked the adjustment and the ability to get them aero AND comfortable. I say that if a rider can't get comfortable on

win with your stuff and even advances like the Internet and how technology has changed the whole immediacy of the energy in cycling - between us and our customers and distributors, even the design process itself." While it's standard that aero products these days are computer-designed, tested, prototyped and manufactured Hed loves to go back to 1984: "The original 3-spoke wheel was designed on a Cray computer - and it was hard to get time on it to design that wheel - now you can do that same thing at home on a PC that cost a couple thousand dollars." While emailing your friends about it at the same time.

"No one had used carbon in bicycles before structurally. That 50 mm depth would've been possible years ago but it would've had to have been out of aluminum and the weight of the wheel would've been prohibitive. Carbon fibre itself hasn't really changed much - there's higher strength, higher modulus stuff - basically the biggest

Where does the future lie? "I'm not sure there's so much more to do in wheels - there'll be some improvement but it's hard to do much more with a wheel."

"I think the future lies in the bike becoming more organic with the rest of the components more integrated into the overall bike - that's where the bike industry will be heading - kind of like SRAM's SmartBar, that is one of the coolest products I've seen in a long time - it's a truly integrated system. Look at a motorcycle, when you buy a Honda every part on there is a Honda part and it all fits together and it all integrates: to me that is the direction that the bicycle industry should be going.

"We know that certain wheels perform better with certain design forks so you need a fork that matches your wheels. We know that adding brakes to normal handlebars makes the bike slower so we

went from a wing-and-a-prayer to now defining the aerodynamic bicycle market. He's happy to talk about the old days and explain aerodynamic principles but right now he's itching to get back to the workshop.

And as he heads for the door there's just time for one last question: what is with little square after the Hed name in the logo? "Oh that," he says with typical proud, smiling understatement, "It's Hed. Period."

Words by Kirsten Begg
Photos by Kirsten Begg / Joseph Muino



MODEL OVERVIEW	SUPERLITE DISC.	TRACK DISC.	STANDARD DISC.
<p>In no compromise situations against the clock, nothing is faster than a disc, and we have three of the worlds very best. Disc wheels are faster than spoked wheels because their solid walls produce significantly less air turbulence than rotating spokes. And this inherent aerodynamic superiority is maximized by our unique lenticular design, not only allowing airflow to pass over its sides with the minimum of resistance, but also grabbing and smoothing the turbulent airflow produced by the hard-working rider. The same trait even deflects treacherous side winds, eliminating the sail effect and enabling you to hold the fastest line right to the tape. So for courses and events where pure speed is the bottom line, a HED disc at the rear is nothing less than the first step towards victory.</p>	<p>When the course is short and sweet enough to put sheer speed above all else, our Superlite disc is simply the fastest wheel in our entire range. And now the latest version is even better than ever. For 2005 we have finally made it Campagnolo compatible. We have also managed to increase the stiffness by 6% over last years model. Achieved without so much as a gram of corresponding weight increase. Lenticular sides take the sting out of the handling and a chemically etched alloy rim signals an end to braking scares when you suddenly need to back off the lightning pace. But that's not the best part. The Superlite is so aerodynamically efficient, that, compared with a standard 32-spoke race wheel, you can expect an average drag saving of 87% into the wind.</p>	<p>Now this is something special, each Track Disc that we manufacture is custom matched to individual rider weight, ensuring the optimum level of stiffness for the lowest possible weight. Which means light, middle and heavyweight riders alike can now enjoy the same level of race inspired stiffness. Only the weight of the wheel changes, tuned to each rider by carefully varying the carbon content. And the Track Disc shares the same advanced lenticular shape and reliable alloy rim specification as its stable mates. Finally, a true custom wheel to complement the advantages frame builders have been able to offer for years.</p>	<p>Let's get one thing straight from the start – don't make the mistake of confusing 'standard' with 'ordinary', because in our capable hands, the standard disc becomes a sophisticated and aerodynamically superior wheel, designed to fly over all sorts of courses, distances and events. This makes it the most versatile and affordable of all our discs, ideally suited to the novice rider who competes in a variety of time trial disciplines. The design shares the lenticular configuration of the other discs in the range, as well as the surety of an aluminium-braking surface. So for anyone planning to race anywhere against the clock, the HED advantage starts right here.</p>



HED.



NEW CARBONLITE DISC

New for 2005 will be our all new carbonlite disc. Due into production around the middle of May 2005 this all carbon tubular fitting wheel will join our carbonlite h3 front wheel as the ultimate in lightweight wheels for pro level competition. Weight will be around 950g for a 700c tubular wheel and both shimano and campag will be catered for by the use of a quick change, swappable cassette body made from cnc machined aluminium. Every last gram has been removed whilst leaving a wheel that has the same structural stiffness as our world-renowned lenticular disc. If this wheel is not on you bike, it will be in front of it!

**MODEL OVERVIEW**

The distinctive three-spoke configuration of the H3 has given it more Tour de France top 10 places, in time trial stages, than any other wheel in the last 10 years, with or without stickers! The shape provides uncompromised handling over flat, hilly or exposed time trial courses, in all weather conditions. As a front wheel it exhibits an aerodynamic efficiency second to none. Fitted to the rear, the outstanding stiffness of the structure translates to optimum power transfer under load. All achieved without the handling drawbacks of a full disc. Little wonder it's such a common sight at professional level competition.

H3

Anyone looking for the fastest wheel against the clock with minimum handling drawbacks can stop right here. The advanced design of the H3 mates three 70mm aerofoil shaped spokes with a rim depth of 53mm. This hard carbon structure is then bonded onto an extruded aluminium alloy rim. The resultant configuration provides the twin benefits of exceptional rigidity and superior aerodynamic performance. In fact, tests reveal the H3 reduces drag by up to 49% when compared with a conventionally spoked race wheel. Which leaves you to expend significantly less energy maintaining the same speed. Or, depending on how good your legs feel on the day, go significantly faster for the same input. Attractive thought, isn't it?



H3 CARBONLITE

The all new carbon H3 wheel came about when the top teams in the pro peloton simply asked us to make our H3 lighter for the hillier time trials, in the 3 main tours.

The shape is unchanged and unsurpassed from our world renowned H3 wheel, but for the carbonlite model we have removed the aluminium rim and bonded an all carbon tubular rim onto the remaining 3 spoke section. The result? The lightest most aerodynamic non spoked wheel in the world! Simple and perfect for against the clock performance. Available in limited numbers.



MODEL OVERVIEW

Our Stinger range has been designed with elite level competition very much in mind. A choice of three rim depths, lets riders select the most suitable model for their preferred discipline, each offering the perfect balance between optimum stiffness and minimum weight. Manufactured from the highest grade of commercially available materials, the design utilises an all-carbon sprint rim, stainless steel Sapim CX-ray elliptical spokes, and an all new, xtra-lite aluminium hub complete with aluminium cassette body. Remember our stinger wheels are built for sheer speed, aerodynamics and total transmission of power. Think of it as the Formula One of cycle wheel performance.

STINGER V9.0 DEEP

The TT specific stinger carbonlite V9.0 is our newest wheel for the coming 05 season. With a rim depth of 90mm it's aerodynamically superior to all other deep sectioned spoked wheels currently on the market. The V9.0's airflow remains stable for the longest possible time due to the depth and, most importantly, the all new aero LMA rim profile. Manufactured from UCC carbon, it has the highest level of rigidity out of all the spoked wheels we make, resulting in unparalleled stiffness and rigidity. Designed for pro level riders participating in timed disciplines. Available in tubular tyre fitment only.



STINGER V5.0

The Stinger v5.0, with a rim depth of 50mm, is built for one thing "sheer speed". Our all new, 50mm cross section, is aerodynamically superior because its shape allows the airflow to remain stable for the longest possible time in the all carbon 2004 stinger range. The hard structure Stinger rim also allows fewer spokes to be used due to its higher level of rigidity, resulting in a stiffer overall design. So if an average drag saving of 42% over a standard 32-spoke race wheel sounds like music to your ears, then the no-compromise Stinger v5.0 is just waiting to impress.



STINGER V2.5

With a rim depth of 25mm, this is the perfect Stinger for general road racing and criterium events and is also the lightest wheel in our 2005 model range. Thanks to the modest shape, the handling remains uncompromised for close control scenarios in a fast paced bunch, yet the aerodynamic efficiency ensures a performance vastly superior to a standard race wheel. The numbers make impressive reading. An average drag saving over a conventional 32-spoke wheel comes out at 33% when measured into a 0, 5, 10 and 15 degree wind, add this to the low weight and, in other words, you get more speed for less work. Something to think about the next time you get caught a mile from home after a lone breakaway.



MODEL OVERVIEW

Road race, time trial or just riding fast for the thrill of it, the Alps is the most versatile wheel we have ever produced. The design takes key elements from wheels throughout our range and combines them into one highly practical unit. The result is a wheel whose aerodynamic performance ensures faster rides and better times compared with a standard race wheel. A wheel with the sort of handling and braking traits you can trust, even in difficult conditions. A wheel that's not going to add excess weight to your bike. A wheel, we believe, that's truly all things to all riders.

ALPS

The key to the versatility of the Alps lies with its unique configuration; an industry first carbon composite design combining a hard structure rim with full length spokes. The former trait provides the high levels of rigidity required for efficient progress; the latter takes the sting from the ride quality. The 51mm depth of the carbon rim automatically guarantees aerodynamic efficiency, while the aluminium alloy braking surface means you can stop without drama. And as if that wasn't enough, it's also the lightest alloy rimmed carbon wheel we have ever produced. We like it; we like it a lot. And so will you.

**MODEL OVERVIEW**

The only soft structure wheel in our 2005 range, the Jet offers riders the option of long distance comfort in an aerodynamically superior package. Riders get a choice of three different rim depths, each targeted at a specific discipline. Shared design features of the Jet range include stainless bladed spokes and an aluminium alloy hub complete with cassette body also in lightweight aluminium. There is also a titanium spoke upgrade option that gets the weight even lower. And utilising a carbon fibre moulding instead of a hard structure rim not only keeps costs realistic, it also significantly enhances ride comfort thanks to the use of full-length spokes. Comfort, versatility and value come as standard with every Jet wheel

JET V40

The Jet 40 has been specifically designed to provide road racers with a clear aero advantage over the rest of the bunch without loss of close control or ride comfort. This is therefore the ideal wheel for mass start distance events, swift enough to maximise the chances of staying away in a break, or even just saving energy when rolling towards that final bunch sprint. The rim comes in two versions, clincher or tubular, both with the advantage of an aluminium braking surface. Road racers and criterium riders alike will love the easy handling qualities, swift response and daylong comfort. (Model not shown)

JET V60

Maintaining the same styling cues as the rest of the Jet range, only this time with a 65mm carbon moulding, the Jet v60 has been built to perform at both road race and time trial events. This versatility, along with an alloy rim offering riders the choice of clincher or tubular configuration, makes it one of the most versatile aero wheels in our entire 2005 range. Compared with a standard spoked race wheel, the aerodynamic advantage is significant, while the handling remains largely uncompromised by side winds. Thanks to the full-length spokes, the comfort factor is also extremely high. Ideal for hours in the saddle, or longer time trial courses.

JET V90

The most aggressively designed of the Jet wheel series, the 90 is at its best over longer distance time trials and tough courses. Fitting a 90mm deep carbon moulding over a conventional alloy rim results in extreme aerodynamic efficiency, yet the ride quality and handling remain largely uncompromised. This is down to the full-length spokes pulling directly against the aluminium alloy rim. And with a conventional aluminium braking surface, you will always have sufficient stopping power to tame the fastest speeds. (Model not shown)



AERODYNAMICS

Aerodynamics is the study of how a solid body moves through the air that surrounds it. So where cyclists are concerned, it's all about how rider and machine can best overcome the air resistance created by their combined forward motion. Here at HED, we are concerned with the business of developing wheels and products that reduce this drag to a minimum. And the lower the drag, the faster you go. But that's not all there is to it.

Keeping things simple for a moment, let's look at the factors that determine your speed on a bicycle. The first is how much power you can generate, as measured in watts. The second is the wind resistance your forward motion creates, commonly referred to as 'drag'. This is usually measured in pounds at a fixed 30 mph in the wind tunnel. All you basically need to know about the relationship between these two factors is that, the faster you go, the more drag there is to overcome. One reason why a rider with a technical advantage can defeat one with a greater power output. And that's where HED can help, because our business is all about developing technical advantages, mostly in wheel form, to cheat drag.

At this point it's wise to know a little bit more about your enemy. A massive 80% of the average rider's output is used solely

to overcome the effects of drag over a flat course. Any reduction in this energy sapping percentage will therefore make you go faster, or mean you need less effort to maintain the same pace.

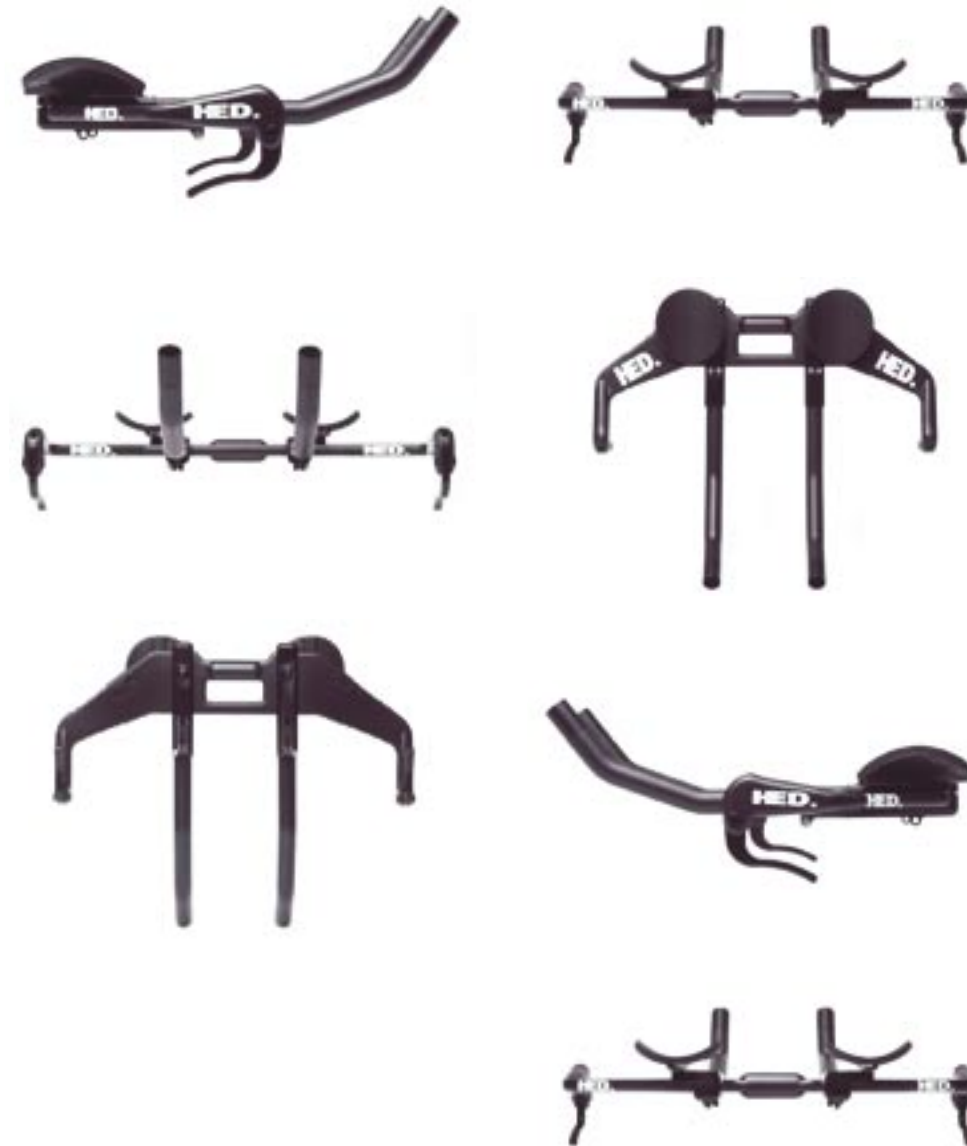
Let's see what that means out on the road. Research has shown that the average Cat 2 rider produces about 300 watts of power. Put the same guy in a typically aero position and he will produce about 7 lbs of drag at 30 mph using standard wheels. Making the switch to Alps wheels can get this figure down to 6.6 lbs. And while a 0.4 lbs reduction may not sound like a lot, it actually represents a saving of almost a minute and a half over a flat 25 mile course in calm conditions. In other words, the difference between handling the silverware or standing back in the crowd. All possible because well designed aero wheels take about half the power of standard spoked wheels to rotate. And a disc does even better, typically requiring between 5 and 7 watts of power to rotate. Compare that with the 30 to 40 watts demanded by a standard spoked wheel and it's easy to imagine just how much time and effort is wasted by unwanted drag.

So now I guess we can assume that you are convinced by the idea of the aerodynamic race wheel providing a significant advantage. However, wind tunnel figures

are only the start of the story. It's no good having the perfect aero wheel if you can't get it to steer in a straight line or carve through tight corners. You will have noticed that most time trial courses have bends, slopes, switchbacks and exposed sections. In other words, your aero wheel needs to be able to handle the real world. Here's how it works. Even in still conditions, a deviation of just a few millimeters turns any frontal aspect headwind immediately into a sidewind. Which is why all HED wheels are designed and tested using wind angles from 0 to 20 degrees, because as we all know, holding a perfect line is impossible. The practical approach ensures optimum performance irrespective of wind conditions, achieved by carefully regulating the size and shape of the wheel's side section. So when we go faster in the wind tunnel, you can be sure you will go faster when you get out on the road.



AEROBAR PROFILES



HED AEROBAR

Our all carbon multi adjustable delta wing aero bar is the result of more than 50 hours of wind tunnel testing. A constant commitment has been made by our technicians towards research in order to develop innovative products. Our 2005 AeroBar is made from F1 grade carbon fibre, with a one-piece hand wrapped construction. For maximum ride comfort and aerodynamics we've built in integrated brake levers and made it completely adjustable in all planes, with uni-directional layering of the carbon fibre, helping absorb vibration for maximum ride comfort and ride control.



CLIPLITE KIT



HED AERO CLIPLITE

The latest edition to our Aerobar range. This simple, and lightweight clip on aerobar, that will fit most standard size handle bars, will transform your everyday road bike into a bike worthy of competing against the clock. Made from CNC machined aluminium and incorporating carbon fibre extenders and arm cups. So if you are new to time trialling, or building a lightweight bike for triathlon or time trials, then look no further.



AEROBAR MODEL L

New for 2005 our aerobar model L, It's our delta wing bar but with all new CNC machined hard wear. Comes as standard with the new "ski" arm extensions. All new CNC hard wear is made from ordinance grade alloy that has been machined down to the minimum resulting in a weight saving over our standard delta wing aerobar of 140g!

Cushion pads not shown.

SKI EXTENSIONS

New for 2005. Ski extensions will fit all HED manufactured delta wing aero bars and clip light bars. The ski bend design enables you to position your arms in the most aero position possible.





VO4 FUSELAGE

2004 / 05 version of our TT specific fuselage keeps the same V0003 custom drawn alloy main triangle as our 2003 model, but new for 05 is the all new UCC carbonlite carbon seat and chain stays providing unparalleled stiffness & comfort. Each frame comes complete with our all new UCC front HBBY fork which has one of the highest stiffness to weight ratios of any moulded all carbon fork - designed as an integral part of our V04 fuselage. Also included is our all carbon aero seat pin and new all carbon saddle as standard. We have also included small design features like a removable front mech hanger and integrated head tube cable routing. Available in 3 sizes S, M & L.

Available in 3 colours - black, black and black!



VO4 COMPONENTS

VO4 COMPOSITE SEAT PIN

Weight at max. length (270mm) 196g

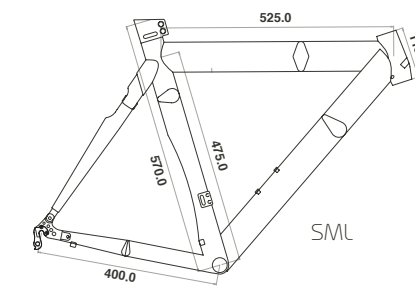
VO4 UCC ALL CARBON FORK

Weight at max. steerer column length (300mm) 420g

VO4 UCC ALL CARBON SADDLE

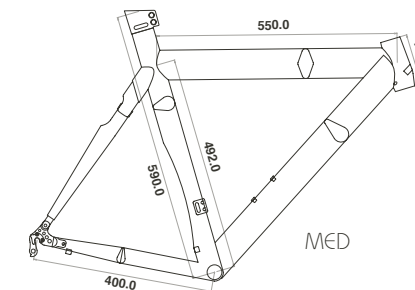
Weight 140g

VO4 TECH



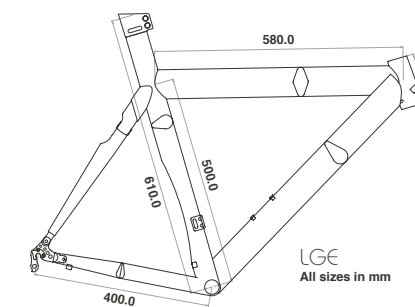
SMALL

Frame Weight: 1575g
 Top Tube Length C/C: 525mm
 Seat Angle: 73.6°
 Head Tube Angle: 73.2°
 Min. Seat Rail Height: 598mm
 Max. Seat Rail Height: 808mm



MEDIUM

Frame Weight: 1623g
 Top Tube Length C/C: 540mm
 Seat Angle: 73.8°
 Head Tube Angle: 74.1°
 Min. Seat Rail Height: 618mm
 Max. Seat Rail Height: 828mm



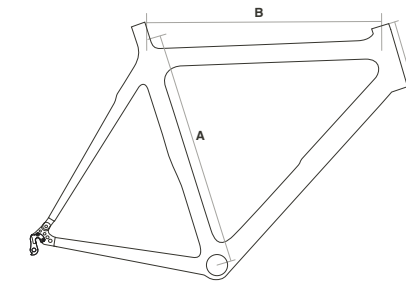
LARGE

Frame Weight: 1681g
 Top Tube Length C/C: 580mm
 Seat Angle: 73.7°
 Head Tube Angle: 75.0°
 Min. Seat Rail Height: 638mm
 Max. Seat Rail Height: 848mm

LGE
 All sizes in mm



R1 TECH



A	B	C
500	525	115
530	540	135
550	555	153
570	570	170
590	585	185
620	600	200

All Sizes in mm

R1 PROJECT

After working diligently to develop a carbon road frame designed specifically to maximize comfort, stability and speed we came up with the R1. This road race specific frame set designed by our advanced composite division will be available in 6 sizes from the beginning of 2005. UCC carbon give a frame weight of just 1215g for the 55-cm model while our monocoque seat stay unit helps eliminate high frequency vibration for unparalleled comfort each R1 frame Comes complete with our new UCC carbon road fork designed as an integral part of our R1 frame set.



ACCESSORIES

01/02/03



04



05



06



07



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ACCESSORIES

01 Ten Speed Campagnolo Cassette Kit
A simple cassette kit to enable you to use our 2002 H3 wheel with your Campagnolo 10 speed set up, available in all ratios from 11 or 12 up.

02 Nine Speed Campagnolo Cassette Kit
As above, but 9 speed.

03 Eight Speed Campagnolo Cassette Kit
As above, but 8 speed.

04 Replacement Bearings
To ensure long life and smooth running.

05 Campagnolo Eight Speed Spacers
If you're changing from Shimano to Campagnolo 8 speed equipment these 8 speed spacers conveniently space your existing cassette to Campagnolo use.

06 Cassette Body
A replacement body for our new Sonic hub available in Campagnolo and Shimano fitment, and interchangeable between hubs enabling you to run one set of wheels on two bikes with different components on each.

07 Front H3 Track Axle
Simply enables you to convert your H3 wheel into a front track wheel.

08 Rear Track Axle
Converts our H3 wheel and screw on disc for track use with the aid of our step down converter (sold separately), available in 2 lengths, 120 mm for track specific bike use and 130 mm for road single speed use.

09 Silca 90
Simply converts your existing track pump enabling you to easily inflate our disc and 3 spoke wheels. This 90 degree adaptor takes the hassle out of inflating your tyres.

10 Replacement Spokes
Available in titanium and stainless steel replacement for all our spoked wheels these aero shaped spokes ensure you keep your wheels in tip-top aerodynamic condition.

11 Truing Tool
This handy 5.5mm T-handle tool enables you to keep your Alps and Jet wheels running true, but please note we only recommend that experienced wheel builders attempt to true any of our spoked wheels.

12 Track Step Down Converter
Made from aerospace grade aluminium this simple screw on adaptor converts any pre 2001 model front H3 wheel or our old style screw on disc for track use. Enables easy sprocket alignment and comes fitted with a hardened steel lock ring.

13 Valve Extenders
Replacement valve extenders for use with all our spoked wheels enabling easy inflation of deep section rims. Available in medium and long length and made from light weight aerospace aluminium.

14 Valve Hole Covers
Designed to cover the valve access holes on our disc and H3 wheels, made from Corstick plastic enabling repeat use. Protects your disc wheel from contaminants entering inside and also ensuring non-disruptive airflow.

15 HED Aero Water Bottle
Fits in between your aero bars for the most aerodynamic advantage. Large capacity will save you time & energy. Maintains your aero position and has large sponge opening for easy fills on the move.

16 HED Wheel Bag
Made from polyester hive weave, with fibre pad filled sides, a pocket for your skewer and an adjustable shoulder strap, ideal for protecting your wheels when they are not in use.

17 HED Body Warmer
Woolly textured fleece body warmer, full zip and 2 deep front pockets. Available in S, M, L, XL and XXL. Available in just one simple colour of black with silver HED logo on the back. Will keep you warm in winter and after that long hard race.

18 HED Hat
Just like our body warmer, it's made to do one thing – keep you warm – available in 4 sizes from small to XL and is made from the same woolly textured fleece. Black with large white HED logo on the front.

19 HED Socks
Made from coolmax, keep your feet in tiptop condition, comes with 'stayfast' ankle pattern and 'air eator' mesh weave sole for 100% comfort. Available in small to XXL, and in black or white.

20 HED Gillet
Light weight fabric gillet, waterproof and breathable, rolls up nice and small to keep in your back pocket and has full zip and zipable rear cargo pocket. Will keep you warm and dry when the weather turns bad.



FREQUENTLY ASKED QUESTIONS

Q.1 Is it true that you have to be riding above 20 mph for aero wheels to make a difference?

A.1 The faster you go, the more power you produce. Efficient use of this power depends on how good your aerodynamics are. The time savings provided by aero wheels will always be proportional to the power of the rider. It doesn't matter whether you produce 300 watts or 150 watts. In fact, slower riders may not be going at the same speed as faster ones, but aero wheels actually save them an even greater amount of time over the same distance. The only exception is on hills, where speeds slower than about 11 mph aren't sufficient to compensate for the aero wheel weight disadvantage.

Q.2 Can certain wind angles push a rider along?

A.2 Think of a guy in a rowing boat, using 'x' amount of power to move along. Then erect a sail the size of a disc wheel. The surface area of this sail isn't enough to propel him without rowing as well, but it will make the rowing easier. This is how a disc wheel works at beneficial wind angles. You can't stop pedalling but it does feel easier.

Q.3 I can only afford one wheel, so which one should it be?

A.3 The front wheel breaks the wind first, so this is the more important of the two. In certain conditions, a front wheel will save twice as much as the rear. However, it also depends on the model of the wheel, because a rear disc will provide at least as much performance as any other aero design on the front.

Q.4 Is aerodynamic performance more important than weight saving?

A.4 let's look at a few figures. Assume a rider uses a conventional bike over a 25 mile flat course time trial. He weighs 150 lbs, his bike is another 20 lbs, and he is producing 185 watts of power. The aero drag with this scenario would be approximately 6.5 lbs using aero bars into a 2 mph headwind of between 0 and 5 degrees. With his standard bike, our rider's time would be 1 hour 7 minutes and 38 seconds. If we reduced the weight of his bike by three pounds, that time would come down by just 3 seconds. However swap the wheels to an aero design and the drag could be reduced to 6 lbs. Even with the additional quarter pound weight of the new wheels, his time saving over 25 miles jumps dramatically to over 1 minute 30 seconds. No contest.

Q.5 Are deep rim aero wheels different to true?

A.5 Soft structure carbon rims in the HED range all feature full length spokes. Once you remove the tyre, they true up just like an ordinary bike wheel. Hard structure rims, like the Stinger, are different; they have shorter spokes pulling directly against the carbon section. However, these are taken from moulds with incredibly close tolerance accuracy, so the intrinsic wheel structure of a HED is twice the level where a conventional wheel would need to be trued.

Q.6 How much time could I save in a 25 mile time trial by switching to aero rims?

A.6 It depends on the wheels. Using our 150 lb test rider in an aero tuck as a model, switching to aero wheels will typically save between 1 minute 30 seconds and 2 minutes over a flat 25 mile course. Using a deep front and disc rear, two minutes is a realistic figure. At the other end of the scale, using a pair of Jet V40 would be worth a saving of 1 minute.

Q.7 How do I fix a computer magnet to a H3 front wheel?

A.7 The majority of cycle computers come with spoke magnets, although some also have adhesive backing on one side. The latter variety is preferable, because the magnet requires sticking to one of the H3's aerofoil blades. It may need building up slightly in order to achieve correct alignment with the receiver on the fork.

WARRANTY

We want you to sleep well at night, so our build quality is beyond question. This is clearly reflected in the 2 year limited warranty given to each product from the date of purchase. So not only are you buying a component that is ahead for reliability, performance, design and for rider satisfaction, you are also buying unparalleled peace of mind. All our products also come as standard with a lifetime crash replacement policy, enabling the owner of a crash damaged product to replace his wheel, aerobar or fuselage at a substantial saving. These attributes along with a desire for progress have helped us emerge as the world's number one composite wheel manufacturer, for plain straightforward performance and practicality, as the many independent surveys of HED owners around the world prove conclusively.

DISCLAIMER

Whilst every effort is made to reproduce accurate information, we reserve the right to change specifications without prior notice. This catalogue cannot be regarded as infallible and as such does not constitute an offer for sale of any particular wheel or specification. All weights given are mean averages.



TECHNICAL DATA

	DISC	SUPERLITE	TRACK	CARBONLITE DISC	H3	H3 CARBON	ALPS	STINGER V2.5	STINGER V5.0	STINGER V9.0	JET V40	JET V65	JET V90
WEIGHT 700C TUB FRONT	n/a	n/a	custom	n/a	850g	670g	650g	450g	580g	670g	782g	852g	962g
WEIGHT 700C TUB REAR	1330g	1260g	custom	970g	990g	830g	890g	680g	810g	880g	926g	926g	1036g
WEIGHT 700C CLINCHER FRONT	n/a	n/a	custom	n/a	875g	n/a	675g	n/a	n/a	n/a	807g	877g	987g
WEIGHT 700C CLINCHER REAR	1355g	n/a	custom	n/a	1015g	n/a	915g	n/a	n/a	n/a	951g	951g	1061g
WEIGHT 650C TUB FRONT	n/a	n/a	custom	n/a	807g	640g	617g	n/a	n/a	n/a	742g	809g	919g
WEIGHT 650C TUB REAR	1263g	1197g	custom	940g	940g	790g	845g	n/a	n/a	n/a	879g	879g	984g
WEIGHT 650C CLINCHER FRONT	n/a	n/a	custom	n/a	831g	n/a	641g	n/a	n/a	n/a	766g	833g	943g
WEIGHT 650C CLINCHER REAR	1287g	n/a	custom	n/a	964g	n/a	869g	n/a	n/a	n/a	903g	903g	1007g
DRAG IN POUNDS													
DEGREES OF WIND ANGLE													
0°	0.411	0.411	0.411	0.380*	0.404	0.404	0.406	n/a	0.410	0.401	0.408	0.422	0.403
5°	0.331	0.331	0.331	0.352*	0.396	0.396	0.393	n/a	0.397	0.352	0.418	0.417	0.357
10°	0.274	0.274	0.274	0.282*	0.383	0.383	0.304	n/a	0.308	0.287	0.437	0.427	0.291
15°	0.061	0.061	0.061	0.120*	0.273	0.273	0.401	n/a	0.405	0.261	0.468	0.406	0.268
STANDARD 32 HOLE WHEEL													
0°	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541	0.541
5°	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606	0.606
10°	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629	0.629
15°	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641
RIM DEPTH	n/a	n/a	n/a	n/a	55mm	55mm	51mm	25mm	50mm	90mm	38mm	62mm	89mm
USAGE OUT OF 5													
TIME TRIAL FRONT	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
TIME TRIAL REAR	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
TRIATHLON FRONT	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
TRIATHLON REAR	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
ROAD RACE FRONT	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
ROAD RACE REAR	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
TRACK FRONT	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
TRACK REAR	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
SHIMANO FIT 7/8/9/10	yes	yes	n/a	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
CAMPAG FIT 8/9/10	no	no	n/a	yes	no	no	yes	yes	yes	yes	yes	yes	yes
CAMPAG FIT WITH KIT													
8 SPEED	yes	yes	n/a	n/a	yes	yes	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9 SPEED	no	no	n/a	n/a	yes	yes	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10 SPEED	no	no	n/a	n/a	yes	yes	n/a	n/a	n/a	n/a	n/a	n/a	n/a

USAGE KEY ●●●●● Excellent ●●●●● Not Suitable

As a continuous plan for improvement, we reserve the right to change specifications without prior notice.



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