

# BP4 DESIGN ROAD HANDLEBAR

WIND TUNNEL & BIOMETRIC TESTING

**BP4**

**D E S I G N**

Patent#.D682,756&RCD002241109-0001

Rider biomechanically optimized for  
Comfort, Power, Efficiency & Aerodynamics.







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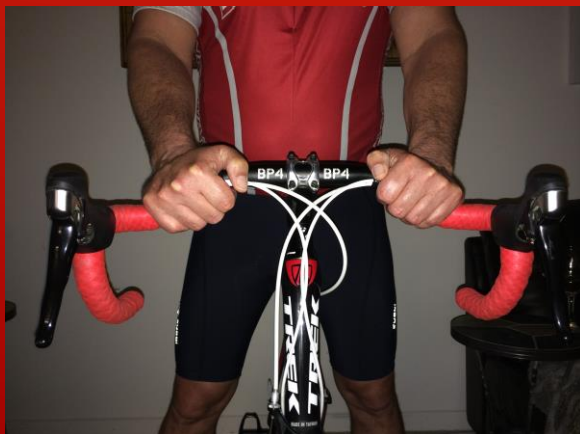
**Conclusion:**

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**“Breakaway Position”**



**VS.**

**Standard Design Road Handlebar:  
Tops, Hoods & Drops**



## FASTER Speed Lab

The FASTER Speed Lab is the world's first, commercial grade, low speed wind tunnel designed specifically for cyclists and the cycling industry.



**THE UHC PRO CYCLING EXPERIENCE**

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UnitedHealthcare PRO CYCLING TEAM

# ROAD BIKE ACTION MAGAZINE

HOME TECH NEWS RACING TDF 2012 RBA FEATURES BIKE TESTS PRO

## FEATURES: BEING THERE: TEAM UHC IN THE WIND TUNNEL

Michael White  
January 10, 2013



United HealthCare Pro Cycling's Adrian Hegyvary hones his time trial position in the Faster wind tunnel.

A few months back, *RBA* visited the [Faster bike shop](#) in Scottsdale, Arizona. More than just a lavish retail showroom featuring brands like Scott, Cervelo and Guru, Faster is arguably the most advanced and performance-oriented bike shop on the planet. That's because it houses a state-of-the-art bike fit studio, recovery areas with compression boots and hot and cold immersion baths, a well-equipped locker room and, oh yeah, a wind tunnel! But it's not just any wind tunnel. It's the world's only tunnel that was specifically

## FASTER Speed Lab

## News

**Cycling illustrated**

RACE CALENDAR MEDIA NEWS CYCLING COLUMNS CYCLING TALK LIFESTYLE CONTACT SHOP

## Dynamic Aerodynamics

October 11, 2012 By Sprint Fresh Leave a Comment

Dynamic Aerodynamics – Body Position Optimization

By Jay White, FASTER aerodynamic engineer

Sitting at my FASTER desk, the view changes considerably from day to day. My 'view' is the main window into the wind tunnel. Some days it is filled with sleek time trial bikes, other days road bikes, and platform arms will be configured for track bikes soon! The best days are those with athletes slicing off the final few grams of aerodynamic drag from bike jersey and bibs. The mantra there is that human skin appears to be VERY aerodynamic.

We all have the mental image of a professional time trial event with a rider frozen into the classic aero position with back flat, head very low, and with arms tucked and elongated to a centered-stretched position. That position is held through corners and up hills as much as possible.

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## Three for Thursday: FASTER has its own wind tunnel

By James Huang | Thursday, Jan 17, 2013 6:00am


0 comments

This week's Three for Thursday column on bike culture, bikes and gear as celebrated by local shops focuses on FASTER in Scottsdale, Arizona. Almost more of a testing and training facility than a conventional bike shop, FASTER doesn't just want to improve your bike, their folks want to improve your performance, too – legally, of course.

FASTER opened its doors in August 2012 with the aims of being "the most comprehensive cycling performance center in the world," according to company president James Kramer. In addition to housing a high-end retail boutique and service area, FASTER's walls also surround a 2-D/3-D bike fitting area (armed with proprietary software), an athlete recovery area outfitted with compression boots and hot/cold water dunk tanks, a metabolic testing clinic, plus locker rooms and



FASTER has its own in-house wind tunnel to help clients refine their positions (Courtesy)



View Thumbnail Gallery

**FASTER**

Profile Design wheels were tested at FASTER, a world-class performance facility with the goal of being cycling's most comprehensive performance center. Based in Scottsdale, AZ, FASTER features the world's first low speed wind tunnel designed specifically for cyclists and cycling manufacturers.






**COMPUTATIONAL FLUID DYNAMICS**

Two years of research and development using Computational Fluid Dynamics helped determine the perfect rim shape. Combining real-world data from thousands of kilometers of testing, we've developed the most advanced rim design for the typical age group performance.

**RESULTS**

Riding on a Profile Design wheel can result in up to 35% performance improvement of wheel aerodynamics compared to a standard rim design.

**EXPERIMENTAL**

Using our own rigorous testing procedures, the full range of Profile Design wheels are also officially certified by the UCI for track and track competition around the world.



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HOME NEWS MORNING SHOW WEATHER SPORTS TRAFFIC LIFESTYLE

Cory's Corner: Pro cycling team trains in 'wind tunnel'

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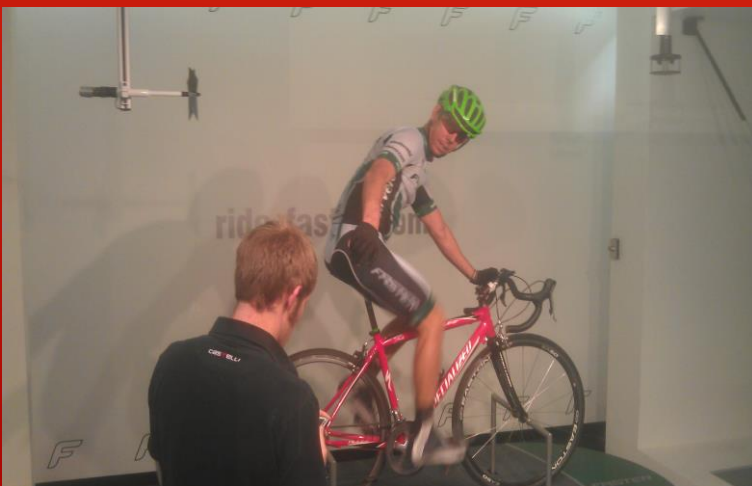


FOX 10  
myfoxphoenix.com  
9:50 50°

CYCLING TEAM TRAINING IN VALLEY  
TRAIN IN WIND TUNNEL TO SIMULATE ROAD CONDITIONS



8 BP4 Design Wind Tunnel Test Week:  
March 10 -14, 2014  
FASTER Lab, Scottsdale Arizona U.S.A







Wind Speed 30 mph	BP4 Angle Net/Total Wind Drag w/rider
Platform Rider Rotation Degrees	Drag in Grams
0	3712
0	3680
15	4078
15	4104
10	3825
10	3858
5	3738
5	3747
0	3773
0	3737
	-127
	* AD
1 minute intervals	

BP4 Design (Breakaway Position) VS. Standard Design (Tops)



Tops- Net/Total Wind Drag w/rider
Drag in Grams
(+116) 3828
(+103) 3783
(+113) 4191
(+108) 4212
(+143) 3968
(+74) 3932
(+304) 4042
(+126) 3873
(+47) 3820
(+135) 3872
+127 *AD

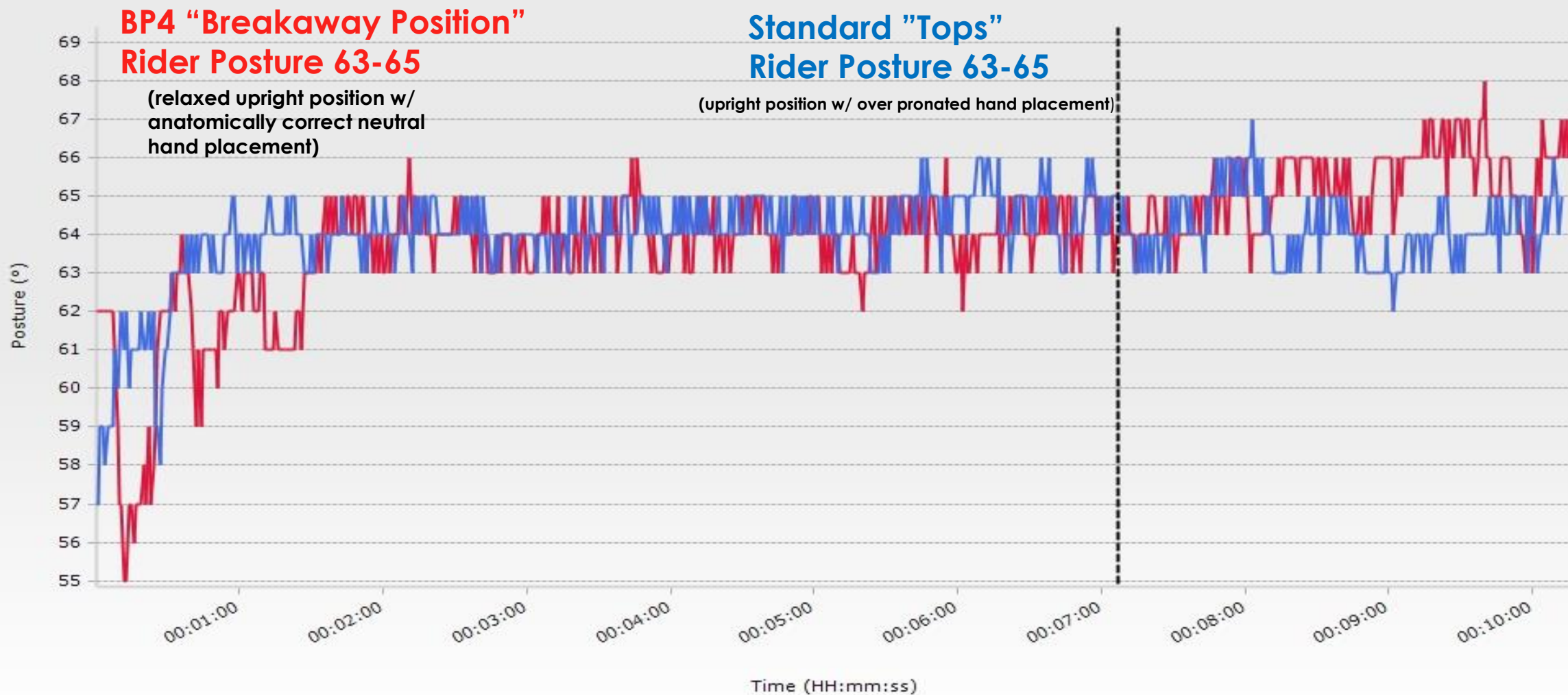
100 Grams of Drag (+/-) = 1 second per 1 kilometer to the rider  
(127 grams \*AD x 40k = 51 seconds)

\*Averaged Drag

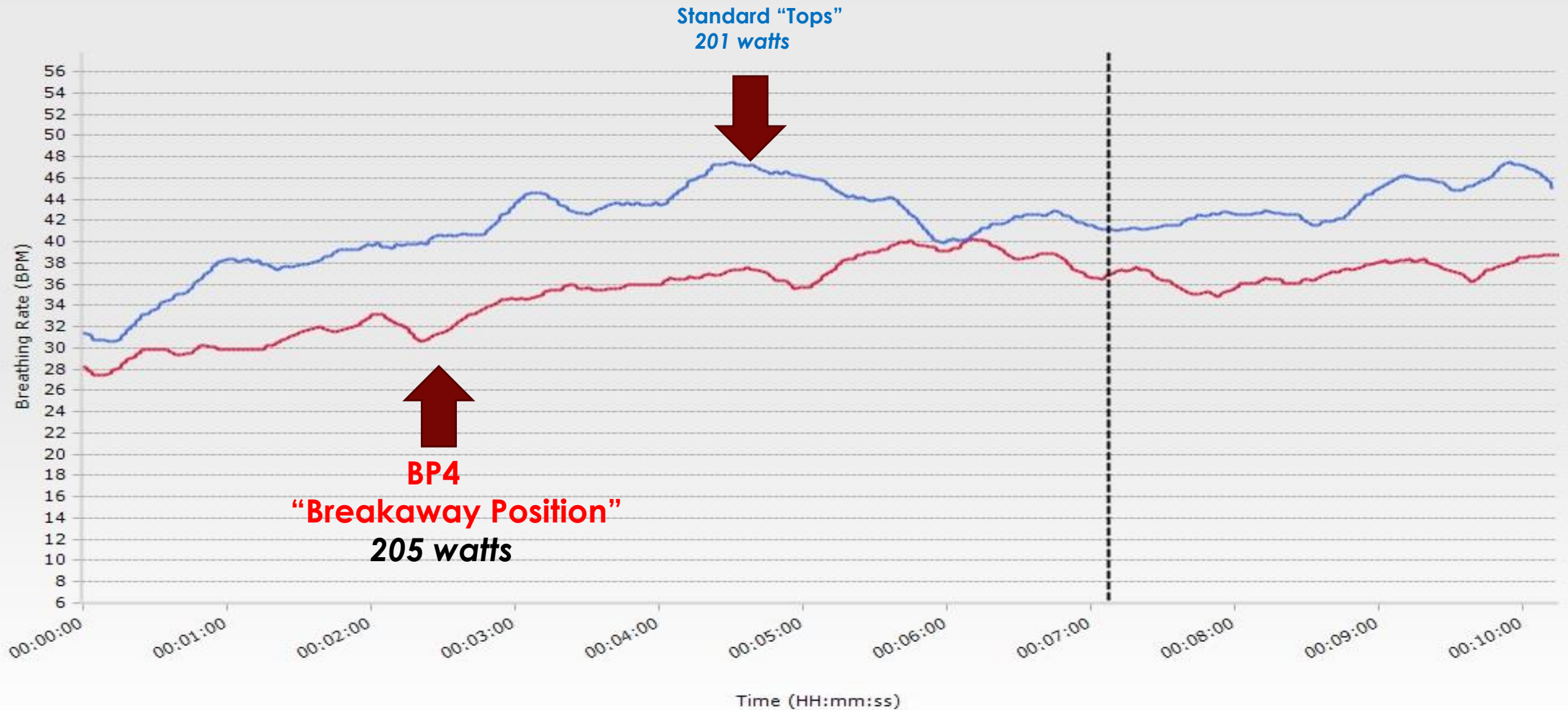
BP4 “Breakaway Position” will save **51 seconds** over 40k



Biometrics  
Posture  
(BP4 vs. Tops)



**BP4 “Breakaway Position”** Rider performed at higher power output with lower (BPM) than standard “**tops**”.





**BP4 Design (Breakaway Position) VS. Standard Design (Hoods)**



Wind Speed 30 mph
Platform Rider Rotation Degrees
0
0
15
15
10
10
5
5
0
0
1 minute Intervals

BP4 Angle Net/Totals Wind Drag w/rider
Drag in Grams
3712
3680
4078
4104
3825
3858
3738
3747
3773
3737
-65 *AD

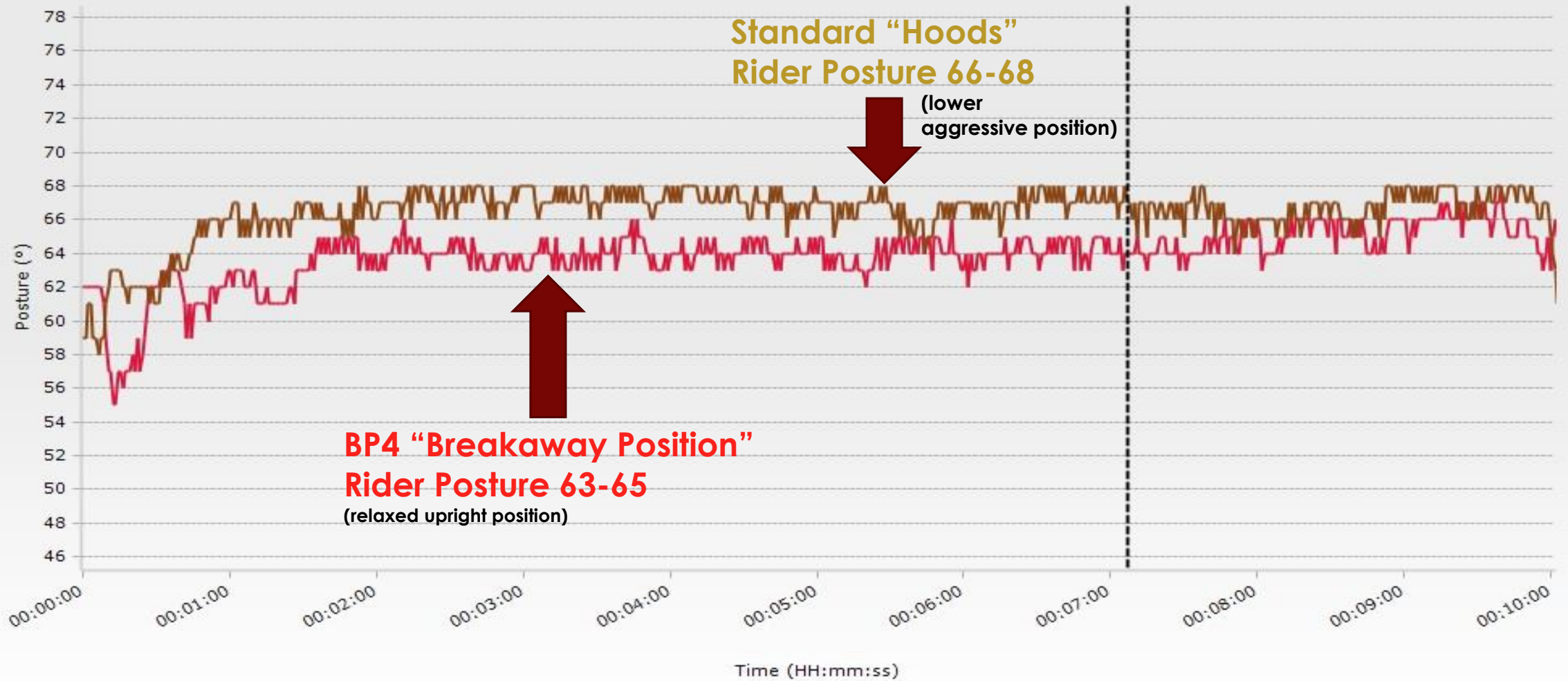
Hoods-Net/Totals Wind Drag w/rider
Drag in Grams
(+108) 3820
(+165) 3845
(-13) 4065
(-118) 3986
(+21) 3846
(-23) 3835
(+117) 3855
(+134) 3881
(+132) 3905
(+131) 3868
+65 *AD

100 Grams of Drag (+/-) = 1 second per 1 kilometer to the rider  
 (65 grams \*AD x 40k = 26 seconds)  
 (131 grams @ 0-5 degrees yaw x 40k = 52 seconds)

\* Averaged Drag

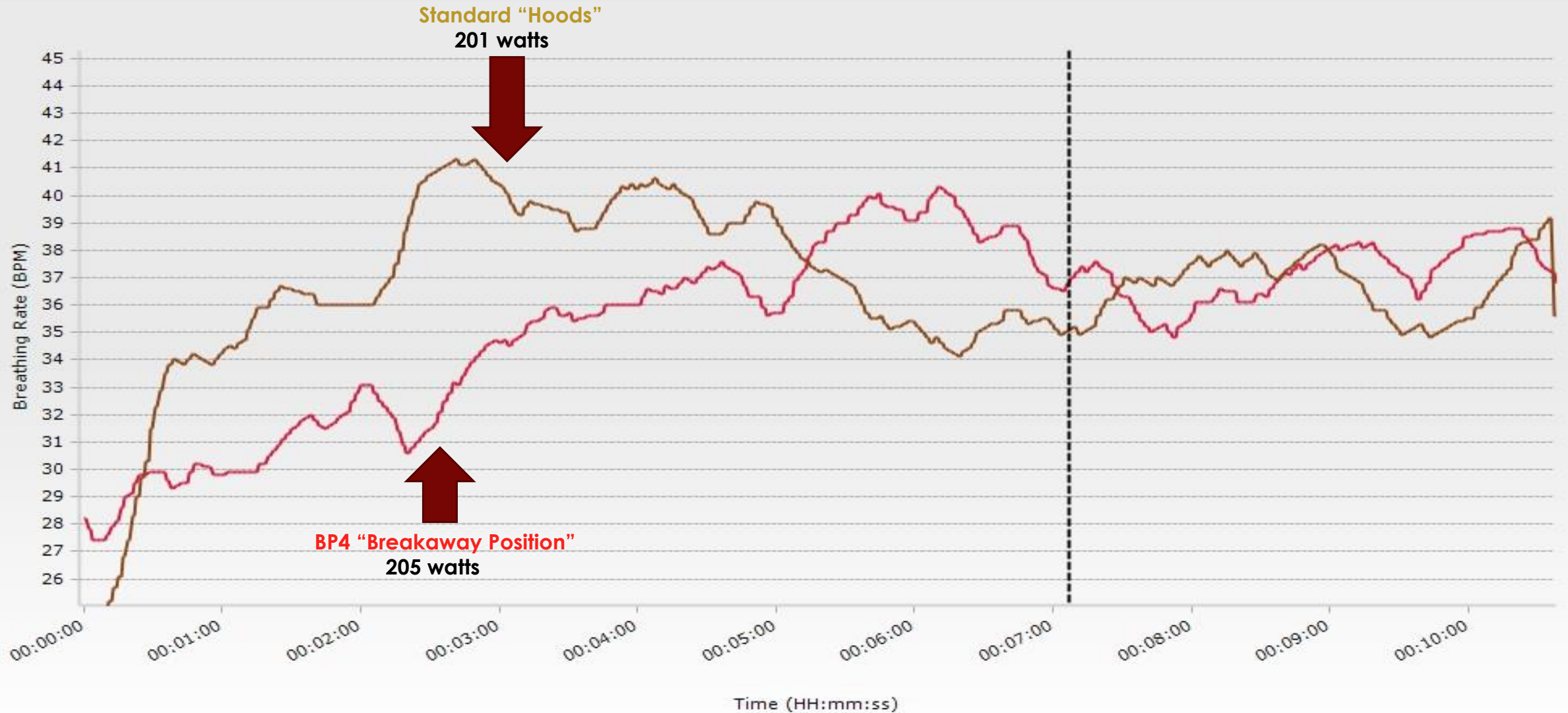
BP4 "Breakaway Position" will save **26 seconds** (\*AD) over 40k and **52 seconds** at or near direct headwind, **0-5** degrees yaw.

## Biometrics (Posture BP4 vs. Hoods)





**BP4 “Breakaway Position”**- Rider performed at higher power output with lower (BPM) than standard “Hoods”.



## BP4 Design (Breakaway Position)

vs.

## Standard Design (Drops)



100 Grams of Drag (+/-) = 1 second per 1 kilometer to the rider  
 (51 grams \*AD x 40k = 20.4 seconds)

Wind  
Speed  
30 mph

BP4 Angle  
Net/Totals  
Wind Drag  
w/ rider

Platform  
Rider  
Rotation  
Degrees

Drag in  
Grams

0 3712

0 3680

15 4078

15 4104

10 3825

10 3858

5 3738

5 3747

0 3773

3737

-51 \*AG

1 Minute  
Intervals

Drops- Net/Totals  
Wind Drag  
w/ rider

Drag in Grams

(+73) 3785

(+65) 3745

(+112) 4190

(-15) 4089

(+54) 3879

(+25) 3883

(+82) 3820

(+67) 3814

(+11) 3784

(+40) 3777

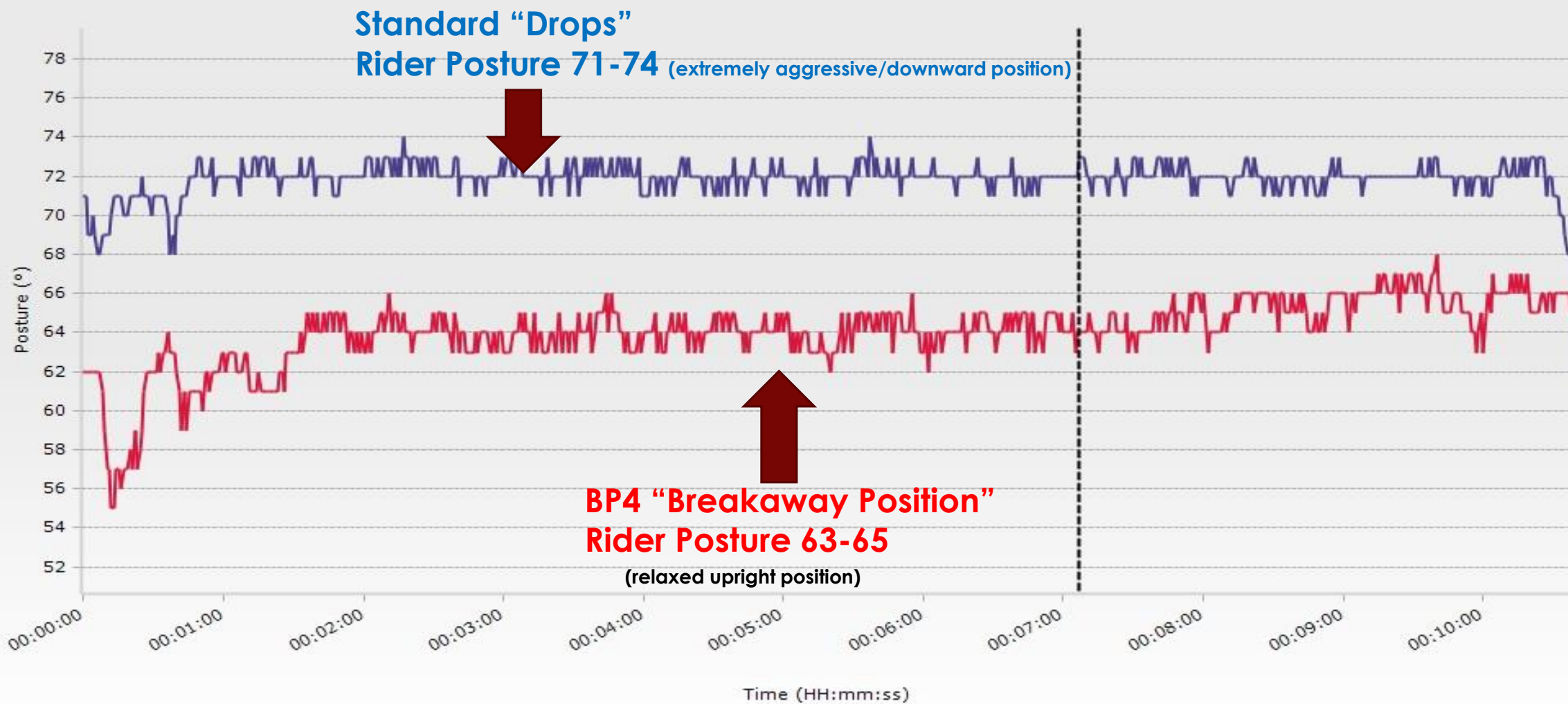
+51 \*AG

\* Averaged Drag

BP4 "Breakaway Position" will save 20.4 seconds over 40k

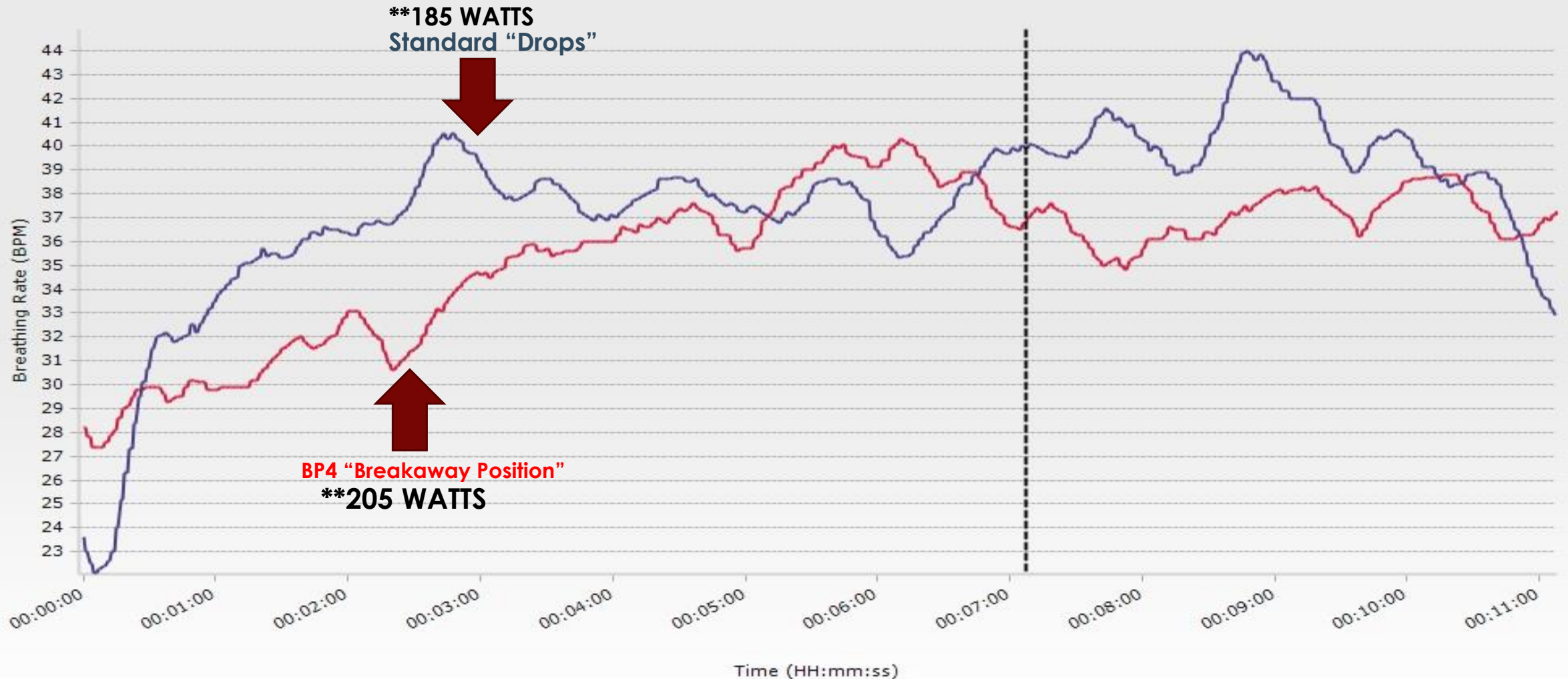


# Biometrics Posture (BP4 vs. Drops)



**BP4 “Breakaway Position”**- Rider performed at **\*\*much higher power output & lower (BPM)** than standard “Drops”.

**\*\*20 watt increase = .05 mph. Rider on BP4 vs. “drops” is 2 minutes faster over 40k w/ less effort and less wind drag.**





## Elements And Components Of Drag In Cycling

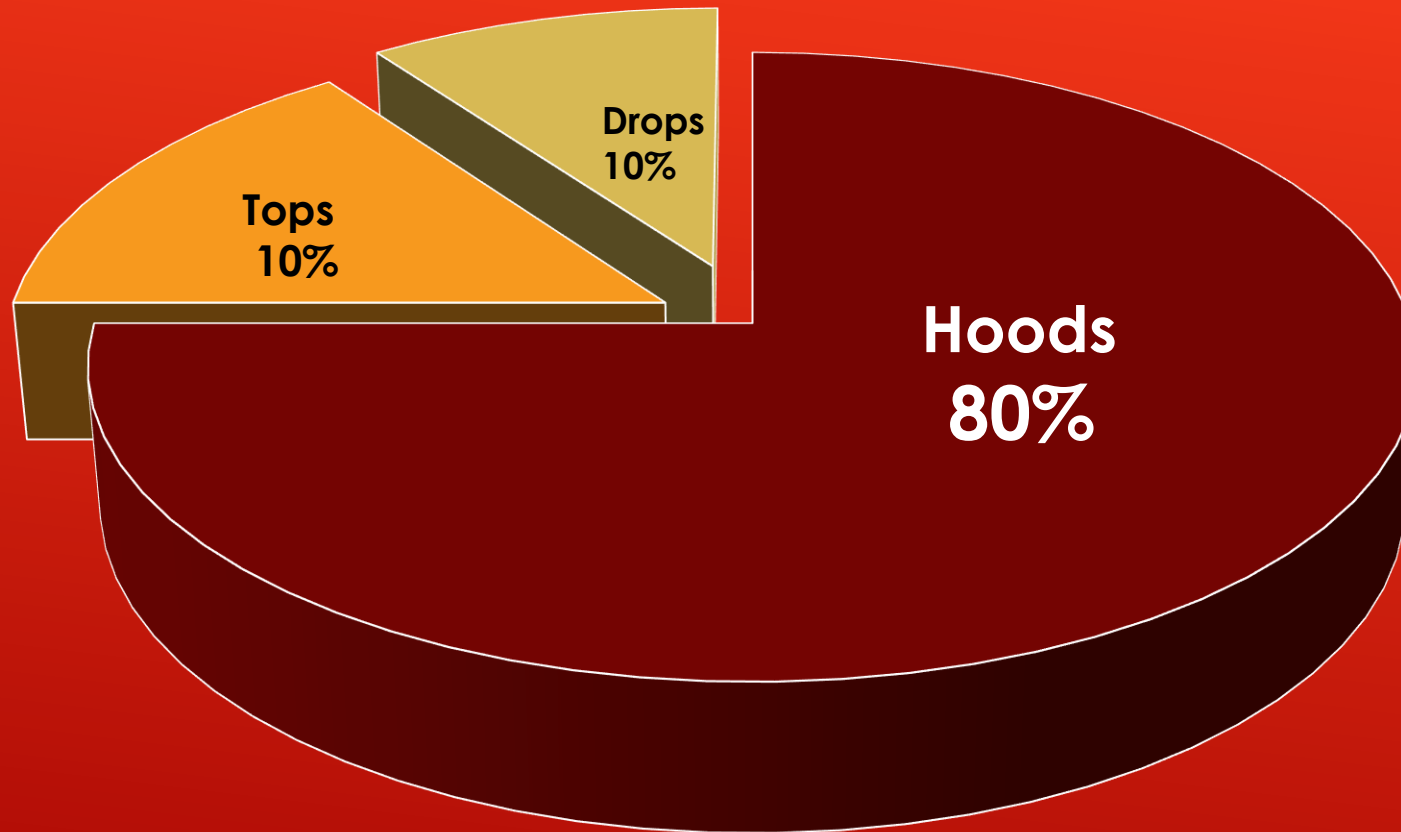
Target	Contributory factors	Influenced by
<b>Form drag</b>	<div>           Frontal area            Form drag            Coefficient         </div>	Competitor physique Competitor posture/ technique Cycle design Rigid costume elements
<b>Skin friction drag</b>	Surface area Surface quality Local velocity over surface	Costume design Costume materials Frame surface treatment Wheel design Wheel diameter Wheel surface treatment
<b>Interaction</b>	<div>           ⚡ Relative position            Wake strength         </div>	Team technique Relative physiques <div>             ⚡ Relative design           </div>

BP4 optimized position  
reduces wind drag

BP4 "Breakaway Position"

## Comfort

\*Test rider's (on the road) approximate estimate of preferred hand position's with standard drop handlebars.

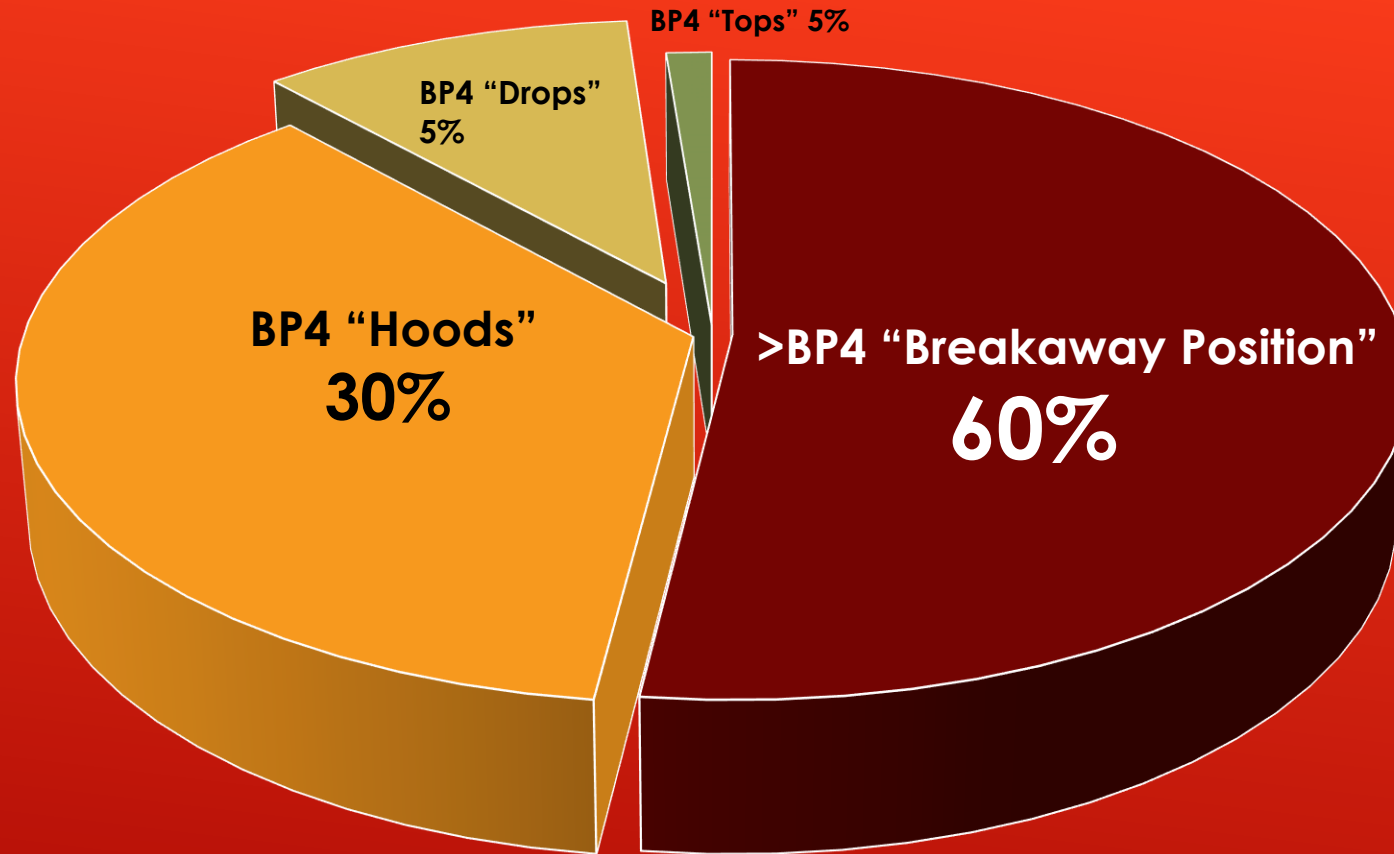


\*Test rider 's average years cycling with standard design handlebars, 10+ years.



## Comfort

\*Test rider's (on the road) approximate estimate of preferred hand position's with BP4 Design handlebars.



# VO2 Hill Climb Test

## BP4 “Breakaway Position”



VS.

## Standard “Tops”



Test conducted by:

Power to the Pedals VO2 Lab



VS.

VO2 Hill Climb Test



## Handlebar Study May/14

### Regular Bars

Watts	VO2 L/Min	VO2/kg	VE L/min	Br/min	RQ	HR	Vt L/min
100	1.775	22.2	42.5	23	0.79	129	1.86
130	2.134	26.7	52.6	25	0.82	138	2.13
160	2.443	30.5	64.5	27	0.87	151	2.37
190	2.814	35.2	87.2	35	0.92	163	2.53
220	3.34	41.7	117	45	0.97	166	2.6

Failure was reached in 23 minutes

### BP4 Results

Watts	VO2 L/Min	VO2/kg	VE L/min	Br/min	RQ	HR	Vt L/min
100	1.732	21.6	45.4	25	0.85	130	1.89
130	1.9	23.8	45.9	20	0.86	136	2.29
160	2.325	29.1	58.3	24	0.88	150	2.43
190	2.732	34.2	72.4	26	0.91	160	2.74
220	3.168	39.2	106	35	0.98	167	3.02

The above data shows a comparison of a single cyclist using regular handlebars vs BP4 handlebars. The workloads are identical, performed on a calibrated Velodyne Ergometer using the subjects own bike. A medical grade SensorMedics Vmax metabolic cart was calibrated before each assessment and used to collect the metabolic data. Each workload was 5 minutes long and the fourth minute of data was averaged and used in the above spreadsheet for comparison. The two VO2 tests were performed one week apart at the same time of day.

**CONCLUSION:** When the subject used the BP4 bars he used less oxygen (VO2) per workload to create the same power output (Watts), took fewer breaths per minute (Br/min) and moved more air per breath (Vt L/min). The subject seems to be more energy efficient and the ventilatory response is lower overall with the BP4 handlebars. Additional testing is required to give statistical significance to these findings since this is only one subject

**Independent lab studies have proven the BP4 road handlebar design is far superior in aerodynamics, power, comfort and rider efficiency than the traditional road handlebar design.**

