GABBA R
WHITE PAPER

The aerodynamic results for the Gabba R are astounding, so we are publishing the complete testing protocol and results in the interest of full transparency.

We developed the Gabba R for going fast in cold and wet conditions. It was developed to be faster than any other jacket, and to limit the aerodynamic drag that comes when you put a jacket over your race suit. So we tested both the short- and long-sleeve Gabba R against Castelli's existing Gabba and Perfetto jackets, as well as testing what happens when you put a Gabba R over the Sanremo BTW road speed suit (as used by the Soudal Quick-Step team).

To summarize the results, the new Gabba R is significantly faster than its predecessor Gabba/Perfetto models, with a 7%-8% lower coefficient of aerodynamic drag (CdA), which translates into approximately 2%-3% faster speeds on the road. Compared to a traditional rain jacket, we see up to 12%-15% lower CdA — although, admittedly, 50 km/h in a rain jacket is not a very realistic test. Our testing indicates a speed increase of around 3%-5% in a Gabba R compared to a traditional rain jacket.

The most surprising result is that a short-sleeve Gabba R worn over a Castelli Sanremo BTW speed suit will actually be faster than just the speed suit in certain conditions. That is an extraordinary statement, so we're sharing our data and testing protocol to allow you to see for yourself. We were surprised ourselves, so we tested it three separate times to confirm. And in all but one test, the Gabba R came out faster than the speed suit alone. Read on to see where it excels and where it doesn't.

TESTING ROUND 1: WIND TUNNEL

TEST DATA

- Wind Tunnel: **Polytechnic University of Milano (Polimi)**
- Date: **January 15, 2024**
- Rider: **Matteo Montaguti (pro 2008-2019)**
- Bike: **Road bike**

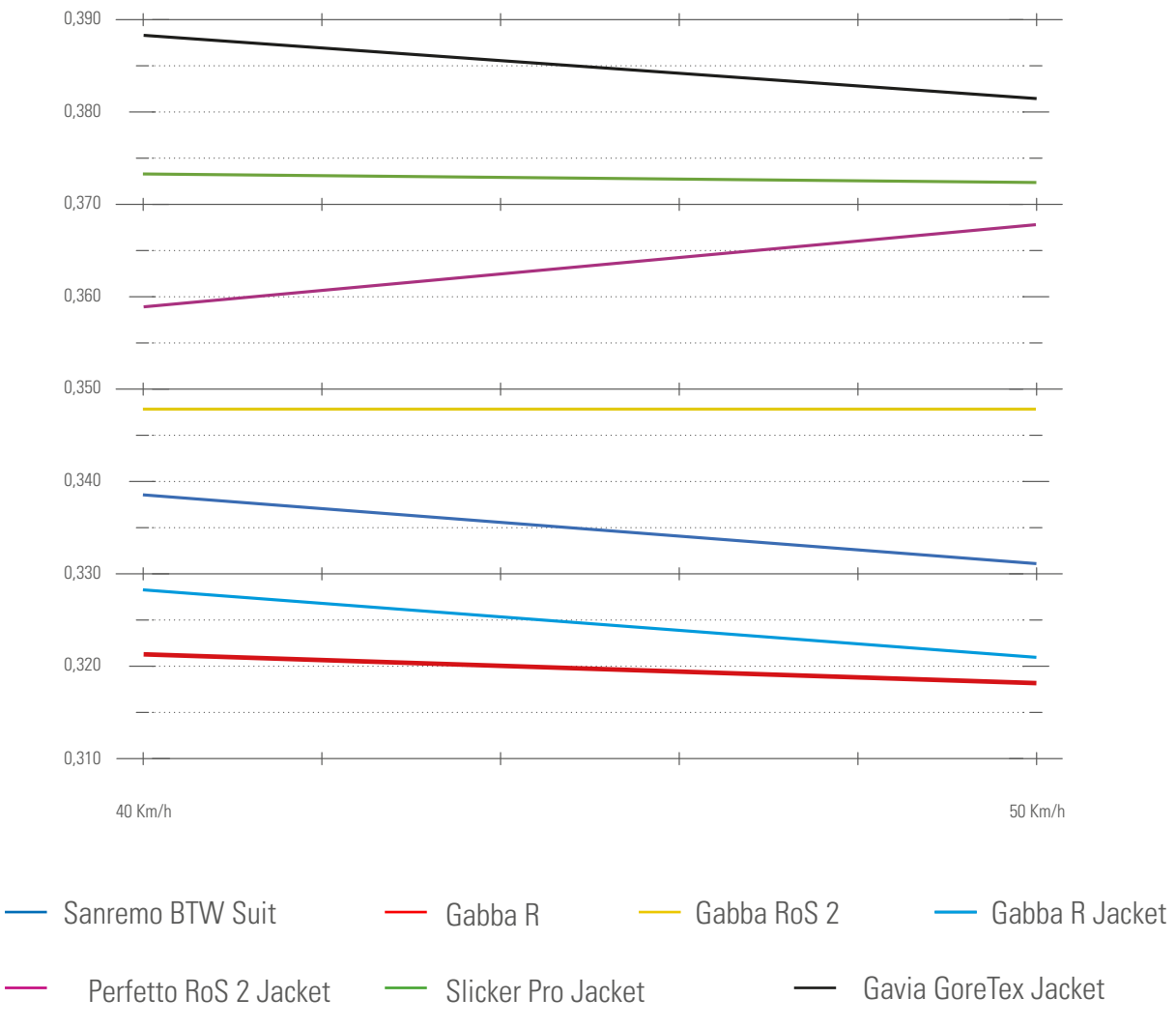
In this test, we specifically tested the new Gabba R short- and long-sleeve jackets against the current Castelli Gabba RoS 2 short-sleeve jacket and the Perfetto RoS 2 long-sleeve jacket, as well as two separate fully waterproof jackets in the Castelli range, the Slicker Pro and the Gavia jackets. Additionally, we tested against the Sanremo BTW speed suit, as used by the Soudal Quick-Step team, to compare the aerodynamics with and without the jacket.

The tests show that the Gabba R is significantly faster than the other jackets in the test, as one would expect. The result that stands out is that the Gabba R, both short- and long-sleeve versions, is faster than the Sanremo BTW suit on its own.

A caveat on this test is due to the methodology. It is very difficult to conduct dynamic road bike testing in the wind tunnel with a pedaling rider in an aggressive low position because very few riders are able to precisely replicate the position repeatedly, so the test results will be dramatically influenced by any difference in position. For this test, the rider held a more "normal" position with hands on the brake hoods and arms relatively straight. However, this position is more upright than one would expect to see from an elite rider at 40 or 50 km/h.

AERODYNAMIC DRAG (CdA)

	40 km/h	50 km/h
Sanremo BTW Suit	0,339	0,332
Gabba R	0,323	0,319
Gabba RoS 2	0,347	0,347
Gabba R Jacket	0,329	0,322
Perfetto RoS 2 Jacket	0,359	0,368
Slicker Pro Jacket	0,375	0,374
Gavia Gore-Tex Jacket	0,387	0,382



TESTING ROUND 2: ROAD TEST

TEST DATA

- Test section: **1,000 m of back road near Nove, Italy; 1 m total elevation difference**
- Date: **January 28, 2024**
- Rider: **Castelli employees Alvin Nordell and Steve Smith**
- Bike: **Road bikes**
- Conditions: **Sunny, calm winds, 13°C**
- Computer: **Garmin 1030 for Alvin, Wahoo Elemnt Roam for Steve**

After seeing the surprising wind-tunnel results of the Gabba R being faster than the Sanremo suit without a jacket, we conducted a follow-up test of the short- and long-sleeve jackets with Castelli employees on a road course.

We used a 1 km stretch of a quiet, mostly flat road and ran multiple successive runs with and without the jacket. We recorded the time and average speed as well as nominal and average watts for each run. We did three round-trip runs with each outfit, which resulted in six timings for each product. Each rider tried to maintain a certain power output with the intention to see time and speed differences based on the clothing. Both riders maintained a low aero position with hands on the hoods, as evidenced by the speed-to-power ratio.

This sort of testing, of course, cannot control for position, wind speed (calm at the start, very slight wind at the end, as we see in the results — however, the out-and-back testing negates the effect of the wind), entry speed, etc. To reduce the variables, we did multiple repeats, swapping A-B-A-B tests back-to-back, and then normalized the speed based on the power output. Note that time normalization is a simple mathematical formula involving the difference in recorded power compared to average power for the overall test.

With the infinite number of variables in this test, we don't consider it a definitive test; however, the results are reasonably consistent and the numbers seem to give a clear indication that the clothing made a measurable difference.

In this test, we confirm the results of the first wind tunnel tests for the short-sleeve Gabba R, seeing an average savings of approximately 1.5 seconds per kilometer. However, the long-sleeve Gabba R is slightly slower here, by about 2 seconds per kilometer. At this point, we can conclude that the Gabba R Jacket demonstrates excellent aerodynamics, close to the performance of the Sanremo speed suit, but very much dependent on the rider, position, and speed.

TEST RESULTS

	TIME (sec)	AVG SPEED	NOMINAL WATTS	AVERAGE WATTS	Time Normalized to Nominal Watts	Time Normalized to Average Watts
GABBA R JACKET						
Run 1 out	94	37,84	289	287	95,2	95,8
Run 3 out	93	38,71	288	284	93,8	93,7
Run 5 out	92	38,66	291	287	93,8	93,7
Average	93,0	38,40	289,3	286,0	94,3	94,4
Run 1 back	95	37,44	286	284	95,2	95,8
Run 3 back	96	37,28	290	283	97,5	96,4
Run 5 back	97	36,93	286	280	97,2	96,4
Average	96,0	37,21	287,3	282,3	96,6	96,2
Run 1 total	189	37,64	287,5	285,5	190,4	191,5
Run 3 total	189	37,98	289	283,5	191,4	190,2
Run 5 total	189	37,77	288,5	283,5	191,0	190,2
Average	189,0	37,80	288,3	284,2	190,9	190,6
NO JACKET						
Run 2 out	93	37,78	280	276	91,2	91,1
Run 4 out	94	38,07	281	282	92,5	94,1
Run 6 out	93	38,48	287	280	93,5	92,4
Average	93,3	38,11	282,7	279,3	92,4	92,5
Run 2 Back	94	37,84	277	275	91,2	91,7
Run 4 Back	96	37,31	286	282	96,2	96,1
Run 6 Back	95	37,71	284	281	94,5	94,7
Average	95,0	37,62	282,3	279,3	94,0	94,2
Run 2 Total	187	37,81	278,5	275,5	182,5	182,9
Run 4 Total	190	37,69	283,5	282	188,7	190,2
Run 6 Total	188	38,09	285,5	280,5	188,1	187,2
Average	188,3	37,86	282,5	279,3	186,4	186,7

	TIME (sec)	AVG SPEED	NOMINAL WATTS	AVERAGE WATTS	Time Normalized to Nominal Watts	Time Normalized to Average Watts
GABBA R SHORT SLEEVE						
Run 1 out	96	37,50	246	246	92,9	93,2
Run 3 out	97	36,74	255	253	97,3	96,8
Run 5 out	95	37,89	258	254	96,4	95,2
Average	96,0	37,38	253,0	251,0	95,5	95,1
Run 1 back	98	36,73	250	248	96,4	95,9
Run 3 back	99	36,00	253	253	98,5	98,8
Run 5 back	98	36,37	258	257	99,4	99,4
Average	98,3	36,37	253,7	252,7	98,1	98,0
Run 1 total	194	37,11	248	247	189,2	189,1
Run 3 total	196	36,37	254	253	195,8	195,7
Run 5 total	193	37,12	258	255,5	195,8	194,6
Average	194,3	36,87	253,3	251,8	193,6	193,1
NO JACKET						
Run 2 out	99	36,36	253	252	98,5	98,4
Run 4 out	97	36,74	261	256	99,6	98,0
Run 6 out	97	37,11	251	251	95,8	96,1
Average	97,7	36,74	255,0	253,0	97,9	97,5
Run 2 Back	97	37,11	253	255	96,5	97,6
Run 4 Back	99	36,36	259	260	100,8	101,6
Run 6 Back	99	36,00	254	256	98,9	100,0
Average	98,3	36,49	255,3	257,0	98,8	99,7
Run 2 Total	196	36,73	253	253,5	195,0	196,1
Run 4 Total	196	36,55	260	258	200,4	199,5
Run 6 Total	196	36,55	252,5	253,5	194,7	196,1
Average	196,0	36,61	255,2	255,0	196,7	197,2

TESTING ROUND 3: WIND TUNNEL

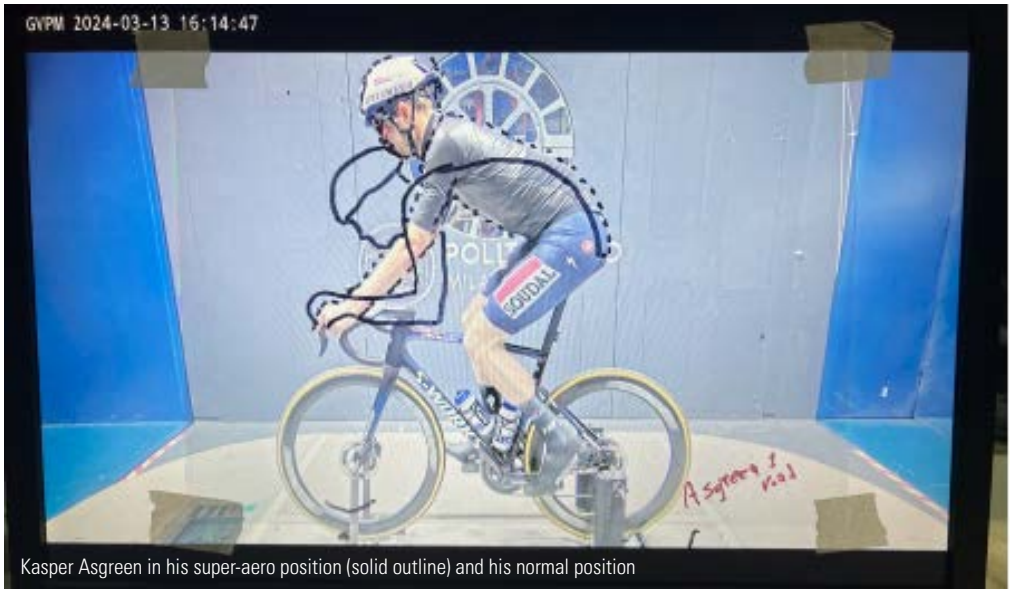
TEST DATA

- Wind Tunnel: **Polytechnic University of Milano (Polimi)**
- Date: **March 13, 2024**
- Rider: **Kasper Asgreen (Soudal Quick-Step team)**
- Bike: **Road bike**

With the first two tests showing that the Gabba R Jacket is faster than the Sanremo BTW suit alone, we conducted a further test with professional rider Kasper Asgreen, who has been testing the Gabba R on the road since December 2023.

The first three runs directly compared the Sanremo BTW suit with the short-sleeve Gabba R and then the Gabba R Jacket. For these tests, we did all runs with the Bolero base layer underneath the suit and the jacket to replicate the conditions of an actual race. Additionally, Kasper used a very aggressive low and aerodynamic position, as he would at peak times during a race. In these conditions, the short-sleeve Gabba R was slower than the speed suit, showing an approximately 2% higher CdA, which would translate to a 0.5%-0.7% slower speed on the road. With the long-sleeve jacket, the CdA worsens by about 4%, which would mean about a 1%-1.5% slower speed on the road. The combination of Kasper's shape and position, possibly together with the influence of the Bolero base layer, show a slightly different result than previous tests. However, we interpret these results as a confirmation that an essentially waterproof, fully windproof jacket can nearly match the aerodynamics of a road speed suit.

As a final test to better understand the aerodynamics of the Gabba R, we had Kasper ride in a "normal" position: hands on hoods, arms mostly straight. In this position, we replicated the results of the first two rounds of testing and saw the Gabba R testing faster than the Sanremo BTW.



Kasper Asgreen in his super-aero position (solid outline) and his normal position

AERODYNAMIC DRAG (CdA)

	40 km/h	50 km/h
Sanremo BTW	0,252	0,247
Sanremo BTW w/ Gabba R	0,257	0,254
Sanremo BTW w/ Gabba R Jacket	0,263	0,256
Sanremo BTW (up position)	0,346	0,337
Sanremo BTW w/ Gabba R (up position)	0,341	0,335