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THE WINDS ARE CHANGING CAMPAGNOLO LAUNCHES NEW AERO OPTIMIZED BORA WHEELS



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The Bora wheelset has been pushing the limits of long lasting, reliable and race-winning performance since its introduction in 1998. Through its long and prestigious history the Bora has evolved and continued its trend of not only winning races but by offering, with each new model solutions and technologies that not only improve the cycling experience but raise the standard for performance road-racing wheelsets in general. Just as the wind from which it takes its name, the Bora is constantly changing, but you can count on it always being decisive, strong and better with each new version. The wind is changing yet again as the Campagnolo Bora introduces yet another standard raising solution for the discerning cyclist looking for a loyal ally in his or her quest for success.

The Bora has become the gold standard in carbon racing wheel solutions for many reasons ranging from reactivity, handling and featherweight yet reliable construction. However, it is wind, or rather penetrating that wind, that gives the wheel its name as aerodynamics are such an important part of its performance. The Bora WTO project took this portion of the wheel's DNA as a central design focus and the Campy Tech Lab dedicated its energies towards pushing the limits of aerodynamic efficiency even further. The result of this task force's labor comes in the form of two wheels, the Bora WTO 77 and Bora WTO 60.

The new acronym, which stands for WIND TUNNEL OPTI-MIZED, is fitting as the line of wheels with whom it is associated incorporate a design that emerged from a Campagnolo engineering task force wholly dedicated to making the most efficient wheels possible in terms of overcoming and reducing resistance. Such a task saw the engineering team spending as many hours in the wind tunnel as in the office, hence the moniker of WTO. The new wheels maintain the classic performance ingredients of their Bora predecessors and counterparts yet add unique design features that will set new standards for aerodynamic efficiency.

While certainly not the only element in an efficient wheel,

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the rim is certainly the largest component in the build and as a result the recipient of a great deal of attention in terms of development. The Campagnolo carbon fiber Bora WTO rims represent the maximum in terms of not only aerodynamic profile design but versatile aerodynamic design. If a wheel is to provide greater aero efficiency it must do so in real world conditions which present many variables and very few constants. Mother Nature does not create wind in a uniform manner or from the same direction. At the same time race courses aren't typically straight nor do riders maintain a perfect position as if in the wind tunnel atop a trainer. With that in mind, Campagnolo engineers set about to account for all of these variables in what has come to represent perhaps the most comprehensive aerodynamic study ever performed by the company to produce wheels that are WIND TUNNEL OPTIMIZED for real world conditions.

Through numerous real world tests performed on two different continents, countless studies of published data relative to wind patterns, days and days of wind tunnel time, CFD analysis and enough mathematical calculations to make a lunar landing the engineering team produced two aerodynamic profiles that confer the most efficient structure available on the market in terms of drag reduction. The Bora WTO rim shape at both 77 and 60mm is efficient to the point that it not only reduces drag, but at certain angles is capable of reducing it to the point of negative drag, almost pushing the wheel forward.

While most aero projects concentrate solely on the rim, the WTO project took a comprehensive look at the entire wheel, ensuring that all components in its build confer aerodynamic efficiencies to the complete unit. To complement the new standard in aero rims both the hub and the spokes were redesigned to ensure a complete aero unit. The new hub, in aluminum construction, follows the same design premise of the rim in that it must be aerodynamic in a versatile manner. Slimmer towards the center and growing in width towards the flanges where it connects with new 3D aero profile spokes.

The efficient wheel is appreciated when out on the road, and as such must be tested, developed and conceived considering the tire with which it is built. The research into making a more efficient rim already called for a wider stance in general but the C19 class structure provided the multiple benefit of a better performing rim design, better fit with the larger tire sizes (25 and 28mm) and an overall more efficient complete unit (tire + rim). The wider stance allows the tire to take on a more aerodynamic shape and as such, allows for the tire to become efficient in terms of drag as well.



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The cyclist must not only overcome aerodynamic resistance in his or her quest for victory but rolling resistance also plays a major role in zapping precious energy from the legs of any rider. While boosting aero efficiency is paramount, reducing rolling resistance pays significant dividends as well. One simple way to improve rolling efficiency is to add extremely efficient bearings. The Bora WTO 77 comes equipped with CULT ceramic bearings, perhaps the most efficient solution on the market (9 times more efficient than standard steel bearings). The Bora One 60 WTO on the other hand rolls smoothly atop USB ceramic bearings.

Rolling resistance is also created where contact between tire and road occurs. According to both our internal research and a myriad of independent studies, rolling resistance varies depending on the type of tire being used. Contrary to popular belief, the tubular tire is the worst performer, the clincher/inner tube represents a significant improvement and tubeless tires offer the least rolling resistance of all. As a result, the Campagnolo engineering department incorporated a carbon fiber 2-WAY-FIT profile in order to offer the possibility to choose between the two most efficient solutions available, tubeless and clincher tires, with no need for additional material or conversions.

The Bora WTO 77 and Bora WTO 60 represent not only the most efficient wheels possible in terms of aerodynamic performance and low rolling resistance but by doing so while maintaining an additional focus on weight makes for an ever more efficient total structure. Lighter wheels make for faster changes in speed that require less energy to move as a result of lower rotational mass. Campagnolo carbon expertise allows for the 77mm and 60mm rim to perform its task at a lower weight than comparable rim heights from competitors. The hubs, made from aerospace grade alloys and engineered to reduce every unnecessary milligram from their construction also contribute to the scant weight of the overall wheel.

The Bora WTO 77, available only as a front wheel considering its specific use for TT and Triathlon, weighs an amazingly low 755gr. The Bora WTO 60, available as a pair, is much more versatile in terms of rim height and overall weight. 670 for the front and 880 grams for the rear makes for a 1550gr total package which renders the Bora WTO 60 capable of offering not only superior aerodynamics over a wide variety of terrain, but do so without a compromise in terms of weight.



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Reducing the weight to a minimum on both wheelsets is a feat in and of itself but doing so while maintaining Campagnolo strict standards in terms of safety and reliability makes these two wheels engineering examples worthy of every accolade they receive.

The Bora name is prestigious and with a long and extremely successful past and present, it has earned its good name time and time again. With that in mind, each innovation released under the Bora name must prove itself worthy of such an important moniker in terms of performance, reliability and innovative race winning design. The new Bora WTO line proves itself without a doubt and proudly joins its Bora family in offering the highest and longest lasting performance available in the world of road racing carbon wheelsets. The winds are changing and the new name for efficient racing solutions is BORA WTO.

BORA WTO 77 - tubular	755 g (FRONT)
BORA WTO 60 - tubular	1550 g (FRONT 670 g + REAR 880 g)

