

## **Aerodynamic Bicycle Torque Augmentation with a Wells Turbine in Wheels**

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**Abstract :** Cyclists often run through a crosswind and sometimes we experience the adverse pressure. We came to an idea that Wells turbine can be used as power augmentation device in the crosswind something like sails of a yacht. Wells turbine always rotates in the same direction irrespective of the incoming flow direction, and we use it in the small-scale power generation in the ocean where waves create an oscillating flow. We incorporate the turbine to the wheel of a bike. A commercial device integrates strain gauges in the crank of a bike and transmitted force and torque applied to the pedal of the bike as an e-mail to the driver's mobile phone. We can analyze the unsteady data in a spreadsheet sent from the crank sensor. We run the bike with the crank sensor on the rollers at the exit of a low-speed wind tunnel and analyze the effect of the crosswind to the wheel with a Wells turbine. We also test the aerodynamic characteristics of the turbine separately. Although power gain depends on the flow direction, several Watts increase might be possible by the Wells turbine incorporated to a bike wheel.

**Keywords :** aerodynamics, Wells turbine, bicycle, wind engineering

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