AeroPod® Tips and Troubleshooting
November 2018

AEROPOD TIPS AND TROUBLESHOOTING

Here are some tips to help you, especially as you get to know more about AeroPod and CdA measurements

- I see different patterns of flashing lights **during sensor pairing** (*Press-hold 4 seconds until flashing green*, then release button)
  1. *Flashing green*— pairing is in process; AeroPod is looking for ANT+ sensors
  2. *3 flashes of yellow during pairing*—AeroPod has paired to your DFPM
  3. *3 flashes of red during pairing*—AeroPod has paired to your *crank-based* cadence sensor. NOTE: if your cadence sensor is "built-in" to your DFPM you won't see the 3 flashes of red light, but AeroPod WILL record your DFPM's cadence data
  4. *Solid green at end of pairing, then light goes out*—pairing process was successful! Proceed to calibration
  5. *Solid red at end of pairing, then light goes out*—**pairing process UNSUCCESSFUL;** speed sensor was not found. Confirm that ANT+ speed sensor and DFPM are awake and attached to bike. Repeat sensor pairing process.
- **After sensor pairing, and when performing calibration**, I see different light patterns
  1. Click, solid red: AeroPod is not paired. Repeat sensor pairing process.
  2. *Click, solid yellow*—AeroPod is ready to begin out-and-back calibration ride process
  3. *Flashing red/green after bike is ridden for a few seconds*—AeroPod will begin cal measurements when button is clicked again. *Click when ready to start cal ride*
  4. *Click, then flashing yellow*—AeroPod is measuring the "out" portion of the calibration ride. Light flashes yellow and watts slowly climb to 50W
  5. *Solid red and 50W is "frozen"*—AeroPod has completed the out portion of the ride. When safe, slow down, STOP, turn around, and ride back towards starting point.
  6. *Flashing yellow, watts climbing from 50W to 70W*—AeroPod is measuring the "back" portion of the ride. At 70W you will be at the starting point of your calibration ride.
  7. *Flashing yellow, watts climbing from 70W to 100W*—AeroPod is measuring your default CdA
  8. *Light goes out at 100W*—calibration is complete and actual DFPM watts are shown. After another 2 minutes of riding, live CdA is shown
- When I wake up AeroPod **after** I've completed a calibration ride, I see different light patterns.
  1. *Flashing green*—AeroPod is looking for your speed and DFPM sensors.
  2. *Flashing green, then light goes out*—AeroPod did not find your speed and/or DFPM sensors. Make sure sensors are awake, then try again. If problem persists, turn off AeroPod (below) then wake up AeroPod again.
  3. *Solid green, then light goes out*—AeroPod has paired to your sensors. You're ready to ride!
- How do I "turn off" AeroPod?
  1. Click button five times in succession. Light shows solid green, then yellow, then red, then goes out; AeroPod is "off".

- I don't see CdA data on my bike computer; I see dashes (---) in the power/CdA/Time Advantage/wind speed/slope fields
  1. Make sure AeroPod is "on" (solid green light when button is pushed)
  2. Make sure DFPM is working and that DFPM is paired to AeroPod
  3. Make sure AeroPod is paired to your bike computer
  4. Ride for a few seconds; this often causes normal readings to begin (--- go to readings)
- When I change ride positions, my CdA and Time Advantage values don't change immediately
  1. CdA measurements are smoothed over a period of 60 seconds. When you do something that causes you to become more (or less) aero, the CdA value will begin to change in a few seconds, but the full extent of the CdA change won't be evident until about 90 seconds has elapsed
  2. Time Advantage is related to CdA, so Time Advantage measurements will also lag by about 60 seconds.
- My CdA values vary, even when I stay in the same ride position
  1. Some amount of CdA variation around the "correct" value is normal.
  2. Riding at a constant level of power reduces CdA variation
  3. Sharp turns, braking, drafting, sharp acceleration can cause CdA to vary significantly. After a few minutes the CdA will smooth-out.
- My CdA number changes somewhen I ride on different road surfaces
  1. This is normal. CdA reported by AeroPod will change when road surface type changes, because road surface changes cause rolling resistance (Crr) to change. AeroPod *assumes* Crr does not change
- My CdA number changes when I ride the same roads on different days
  1. Make sure to inflate your tires to the same pressure prior to every ride. Different tire pressures cause Crr (and, consequently, CdA) to vary
  2. Temperature variations from day to day can cause CdA measurements to change
  3. Make sure air movement over the pitot tube is not obstructed or blocked
- My Time Advantage information seems "off"
  1. When you ride in your "normal" position Time Advantage should not change much
  2. If Time Advantage changes, even when riding in normal position, then do a new calibration ride
  3. It is normal for Time Advantage measurements to lag by about 60 seconds
- When testing, I don't see significant changes in CdA when I change "x" ("x" is changing to a different piece of equipment, or to a different ride position)
  1. It's easier to measure small CdA changes when you test at higher speeds—22 mph or more
  2. Make sure AeroPod and your DFPM have been calibrated correctly
  3. Especially when making minor changes to your aero setup, don't expect to see significant changes in CdA. The more "minor" your change is, the more important it is to get calibrations correct, and to perform testing according to the recommendations in this document.

4. Small differences are more easily detected over longer testing periods—10 to 15 minutes.
5. Small changes will be most easily determined using the Isaac CdA Analysis window
6. A “rule of thumb” is that a CdA change of .001 reflects a 1 watt difference between applied and opposing power readings. This is a small difference in power readings.

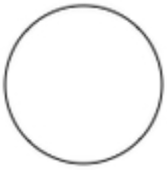
APPENDIX: What is "CdA"?

The single number "CdA" is actually comprised of two components: your "frontal surface area (A)"—that is, the surface area your body and bike present to the wind in the direction of travel; and the "coefficient of drag (Cd)", a number quantifying the benefit you get from making the wind flow more smoothly around you and the bike.

In fact, CdA is the product of these two numbers:

CdA = Cd x A

To show how these two factors interrelate, here is a simple example. Suppose you put a round, flat disk in a wind tunnel, exposed to the wind. Viewed from the front the disk looks like this:



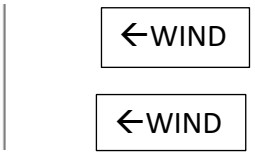
Round disk, frontal surface area A = 1

Let's suppose we set the diameter of the round disk so that it has a frontal surface area of "1". So, "A" = 1

Wind is now blown against the disk. *The "frontal surface area" the wind encounters when hitting the disk is "1"*.

<u>But to know how much force the wind actually exerts on the disk, we also need to know the disk's coefficient of drag.</u>

What is the Cd of a round, flat disk? From a side view the flat disk has no depth, so it looks like a thin sliver:



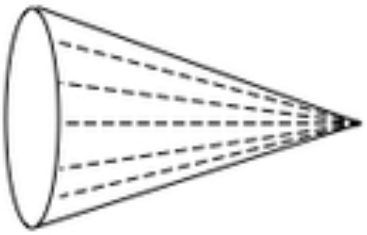
As it turns out, the coefficient of drag (Cd) of a round, flat disk is 1.17. So, the CdA of our round, flat disk is

$CdA_{flatdisk}$ = 1 x 1.17 = 1.17

"1.17" is the CdA used to calculate in wind forces acting on a flat disk with area "1".

How can we make a round disk, with a frontal surface area of "1", more aerodynamic?

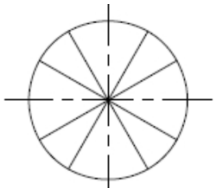
One way is to turn the disk into a cone that points into the wind.



← WIND

← WIND

Note that, looking at the cone directly from its front, *it still looks like a round disk with frontal surface area = 1*



CONE VIEWED FROM THE FRONT—FRONTAL SURFACE AREA IS STILL "1"

However, ***the conical shape improves the flow of wind around the disk, reducing Cd***.

In fact, if the "angle" of the cone is 60 degrees, the Cd is reduced from 1.17 to 0.50.

So, $\boldsymbol{CdA_{cone} = 1 \times 0.50 = 0.50.}$

A cone with a frontal surface area of "1", pointed into the wind, has a CdA more than 50% lower than a round, flat disk with the same area!

So, a round, flat disk becomes more "aero" by adding a conical aero shape in front of it!

Summary

CdA encompasses two factors: frontal surface area, and coefficient of drag. Lower CdA is "better". Cyclists can alter their ride position to reduce frontal surface area, and additionally use aero-optimized equipment to reduce their coefficient of drag.