

# RAY MAKER - DCRAINMAKER

SUMMARY REPORT - SEPTEMBER 14, 2015



**SPECIALIZED**

# SUMMARY

- **Objective:** testing a variety of handlebar-mounted action sports cameras, cycling computers, and mounts.
- **Action Sports Cameras:**
  - GoPro Hero4 Session
  - GoPro Hero4 Silver Edition (with and without waterproof housing)
  - Garmin VIRB XE
  - Sony Action Cam (with and without waterproof housing)
- **Cycling Computers:**
  - Garmin 520, 810, 1000
- **Cycling Computer Mounts** (both mounts had camera adaptors):
  - K-Edge Mount
  - Barfly SLi Mount

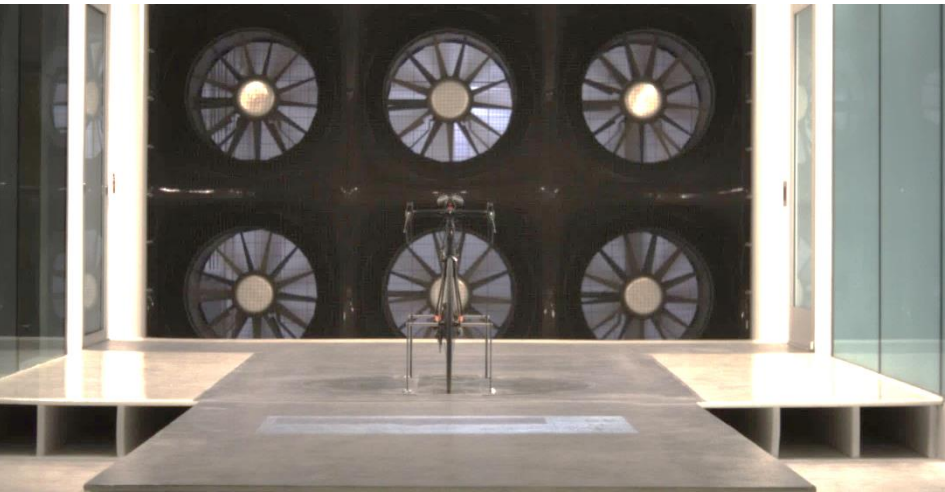
# REFERENCE

- All of the following graphs will have the same scale (drag area in  $\text{m}^2$ ).
- Lower is faster, higher is slower.
- On all graphs, this arrow is included for perspective. It represents the approx. difference between a Prevail and Evade on the same scale (think Map Scale). It is only included for a reference, and its location on the plot is not relevant.
- This difference is roughly equal to 46 seconds saved over a 40km distance.
- One division on the y-axis is roughly equal to 4 seconds over 40km - or ~1 watt at 40kph.
- *The standard deviation of the test set up is included as error bars on one plot in each chart.*

**Prevail**  
↑  
↓  
**Evade**

# TEST SET UP

- All of the day's testing was conducted using a 58cm S-Works Venge 10R frame with a traditional handlebar, CLX60 wheels with 24mm S-Works Turbo Tires, and a full SRAM Red group set.
- The only things that changed between tests were the cameras, cycling computers, or mounts. All other equipment remained the same.
- Tests were conducted at 50kph, with both wheels spun up to 50kph as well. Yaw (crosswind) sweeps were conducted from -10 degrees to 10 degrees in 5 degree increments. Each point was the average of 30 seconds of data collection.



TEST SET #1

# **ACTION SPORTS CAMERAS**

# TESTING PHOTOS



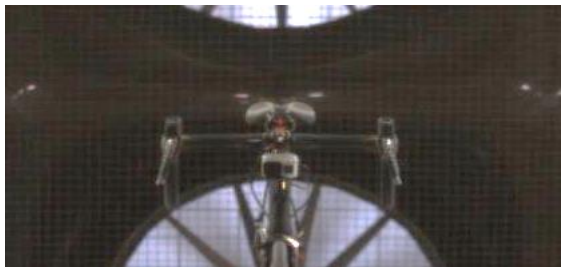
Bike Alone



GoPro Hero4 Session



GoPro Hero 4 Silver



GoPro Hero4 with Housing



Sony Action Cam



Sony Action Cam Housing



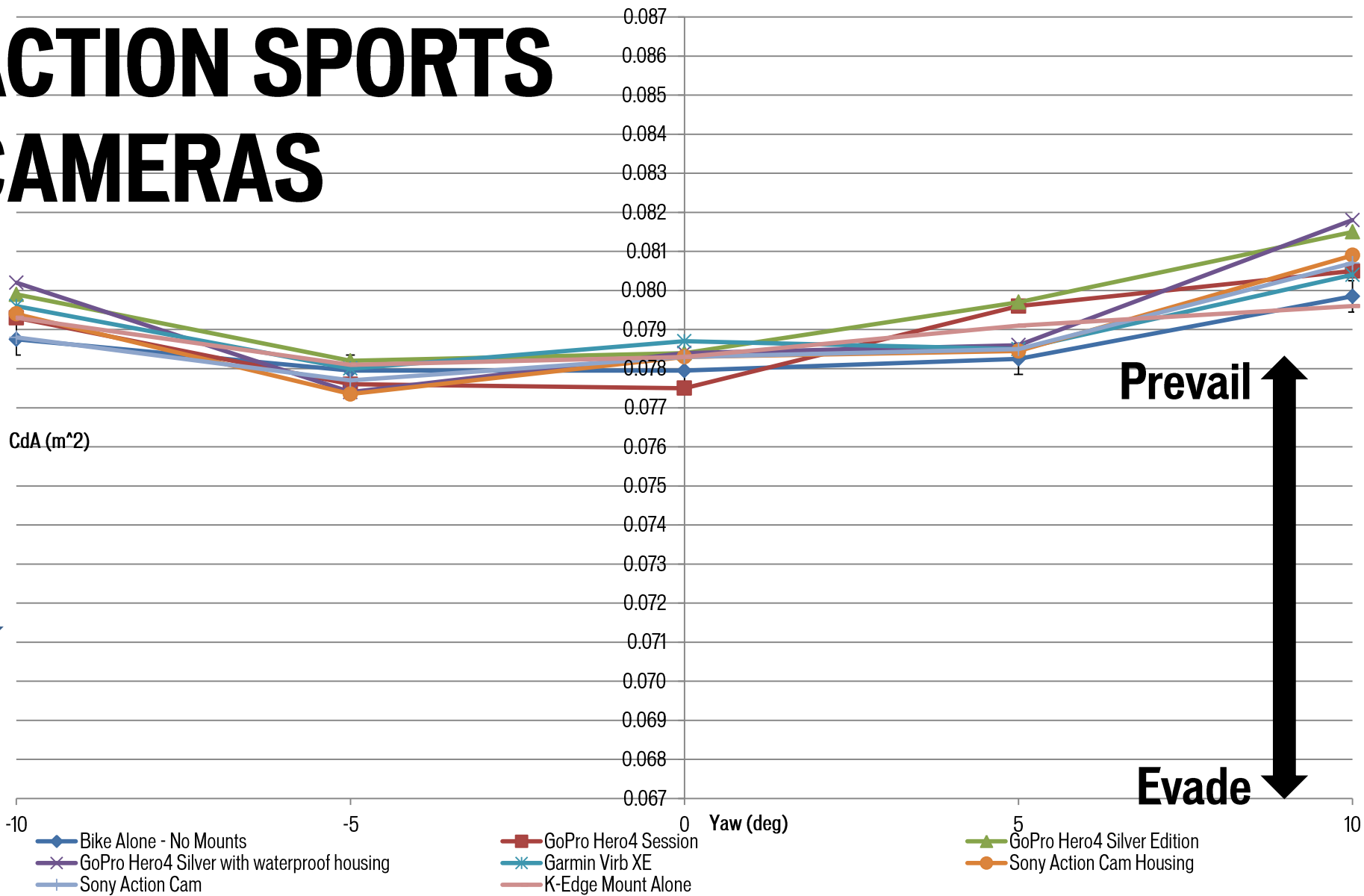
Garmin VIRB XE



K-Edge Mount Alone

# ACTION SPORTS CAMERAS

FASTER  
↓



# RESULTS & TAKE AWAYS

- **Action Sports Cameras:**
  - GoPro Hero4 Session
    - The fastest set up. The camera was roughly the same as bike alone, with no negative impact on aerodynamic performance.
  - GoPro Hero4 Silver Edition (with and without waterproof housing)
    - The housing was minimal enough that it caused very little difference in aerodynamic performance.
    - The camera itself was between 2-4 seconds slower over 40km (at zero deg, head on with the wind) when compared to no camera.
  - Garmin VIRB XE
    - This was the slowest camera - at roughly 4 seconds slower over 40km.
  - Sony Action Cam (with and without waterproof housing)
    - Similar to the GoPro Hero4 Silver edition, the performance was roughly the same with or without the housing, at 2-4 seconds slower over 40km.



TEST SET #2

# **CYCLING COMPUTERS**

# TESTING PHOTOS

Garmin 520



Garmin 810

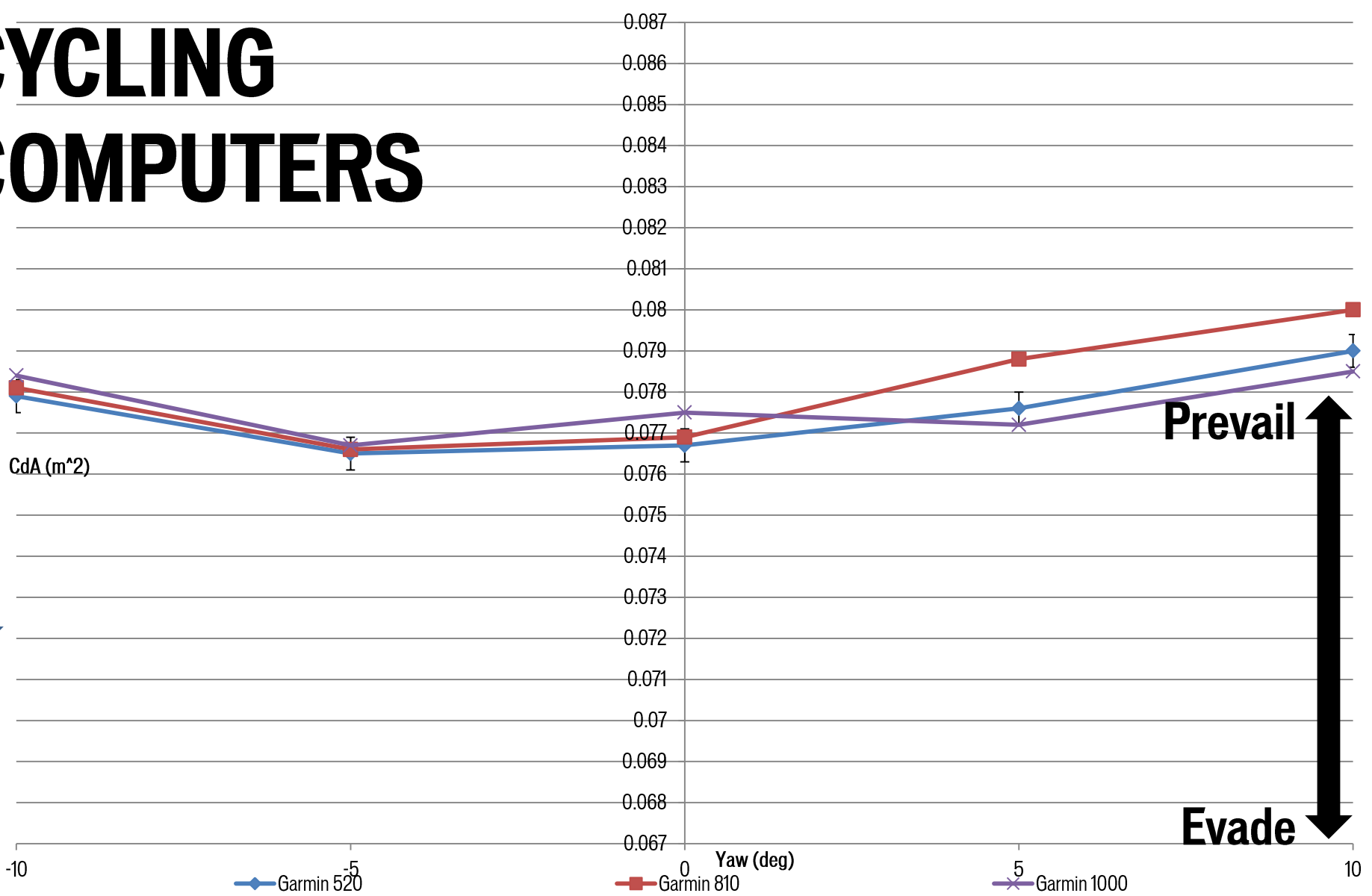


Garmin 1000



# CYCLING COMPUTERS

FASTER  
↓



# RESULTS & TAKE AWAYS

- **Cycling Computers:**
  - *The mount was likely shifted during the previous set of tests* (GoPro mounting screws) as the values from mount alone were not similar to with a GoPro mounted.
    - The following results will be compared against the Garmin 520's results.
  - Garmin 520
    - Considered the 'fastest' computer (from the results).
  - Garmin 810
    - Nearly identical performance at zero degrees (within the standard error).
  - Garmin 1000
    - *There was a small shift between the two runs with this computer* - so the results show that the computer was slower by 4-8 seconds over 40km.

TEST SET #3

# **CYCLING COMPUTER MOUNTS**

# TESTING PHOTOS



K-Edge Mount Alone



Barfly SLi Mount Alone

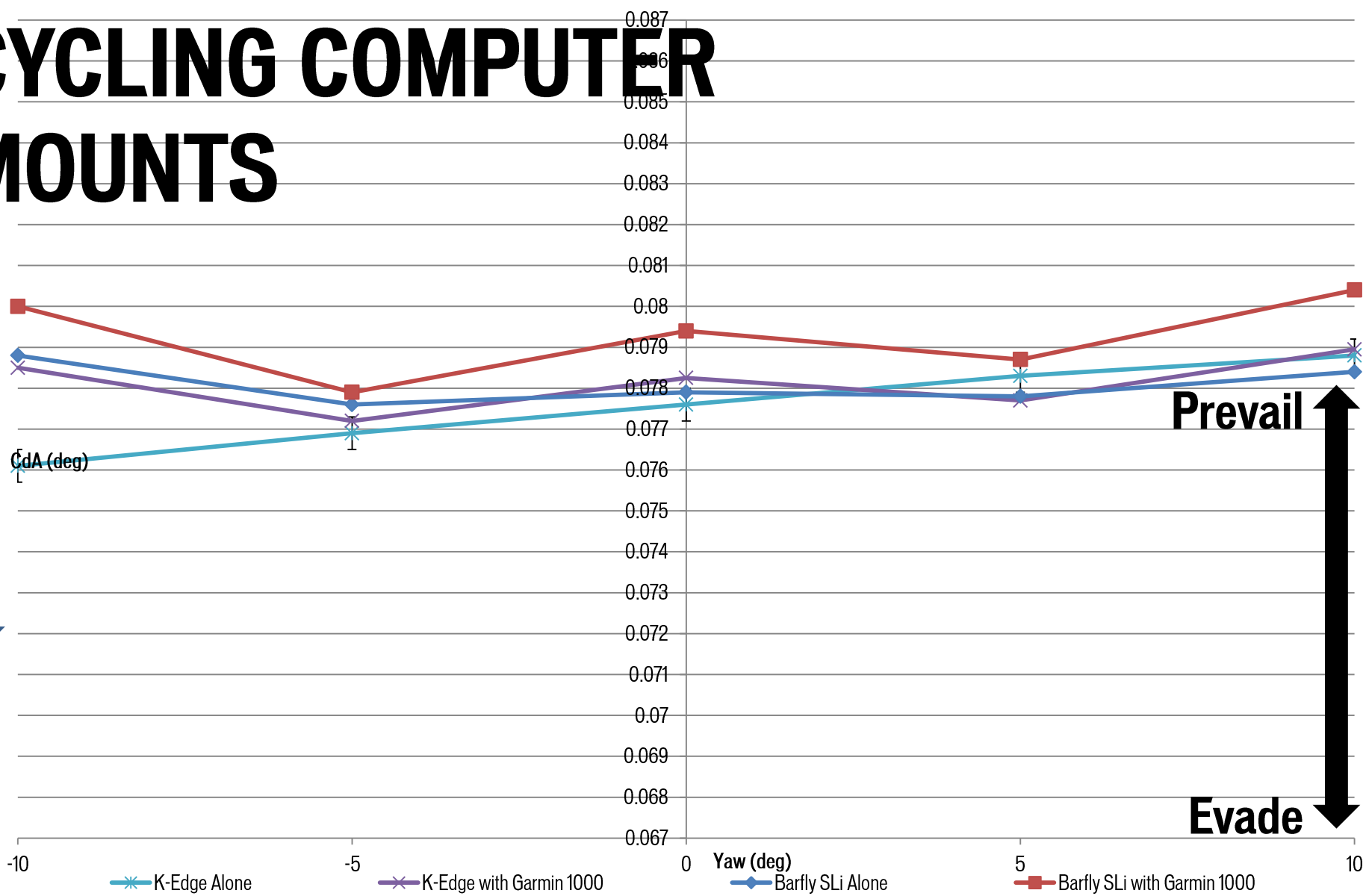


K-Edge with Garmin 1000



Barfly SLi with Garmin 1000

# CYCLING COMPUTER MOUNTS



# RESULTS & TAKE AWAYS

- **Cycling Computer Mounts** (both mounts had camera adaptors):
  - K-Edge Mount
    - With the addition of a Garmin, this mount was still the fastest (at zero deg).
  - Barfly SLi Mount
    - *It was noted that the mount was tilted at a slight upward angle* - mount alone tested almost identically to the K-Edge, but with the Garmin, the mount performed about 4 seconds slower over 40km.
  - These two mounts have performed nearly identically in previous tests.



TEST SET #4

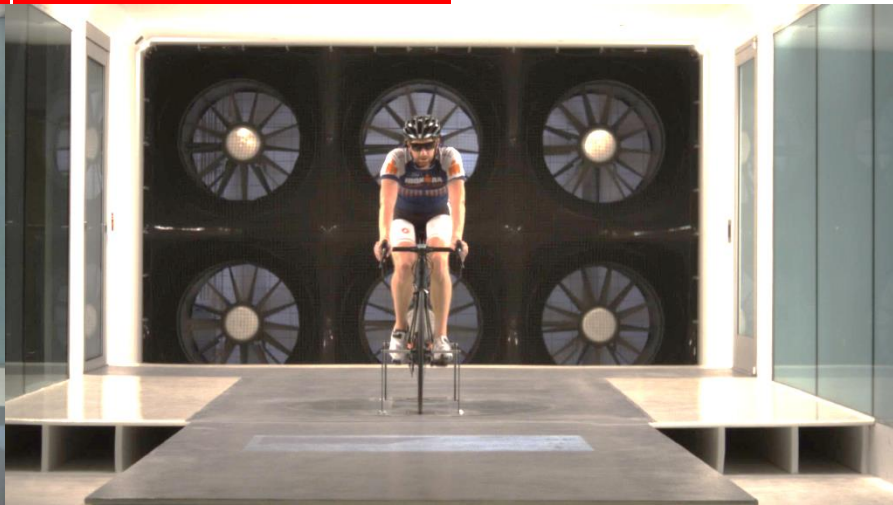
**RAY ON BIKE**

# TESTING PHOTOS

Recon Jet - No Pods



Recon Jet - No Pods



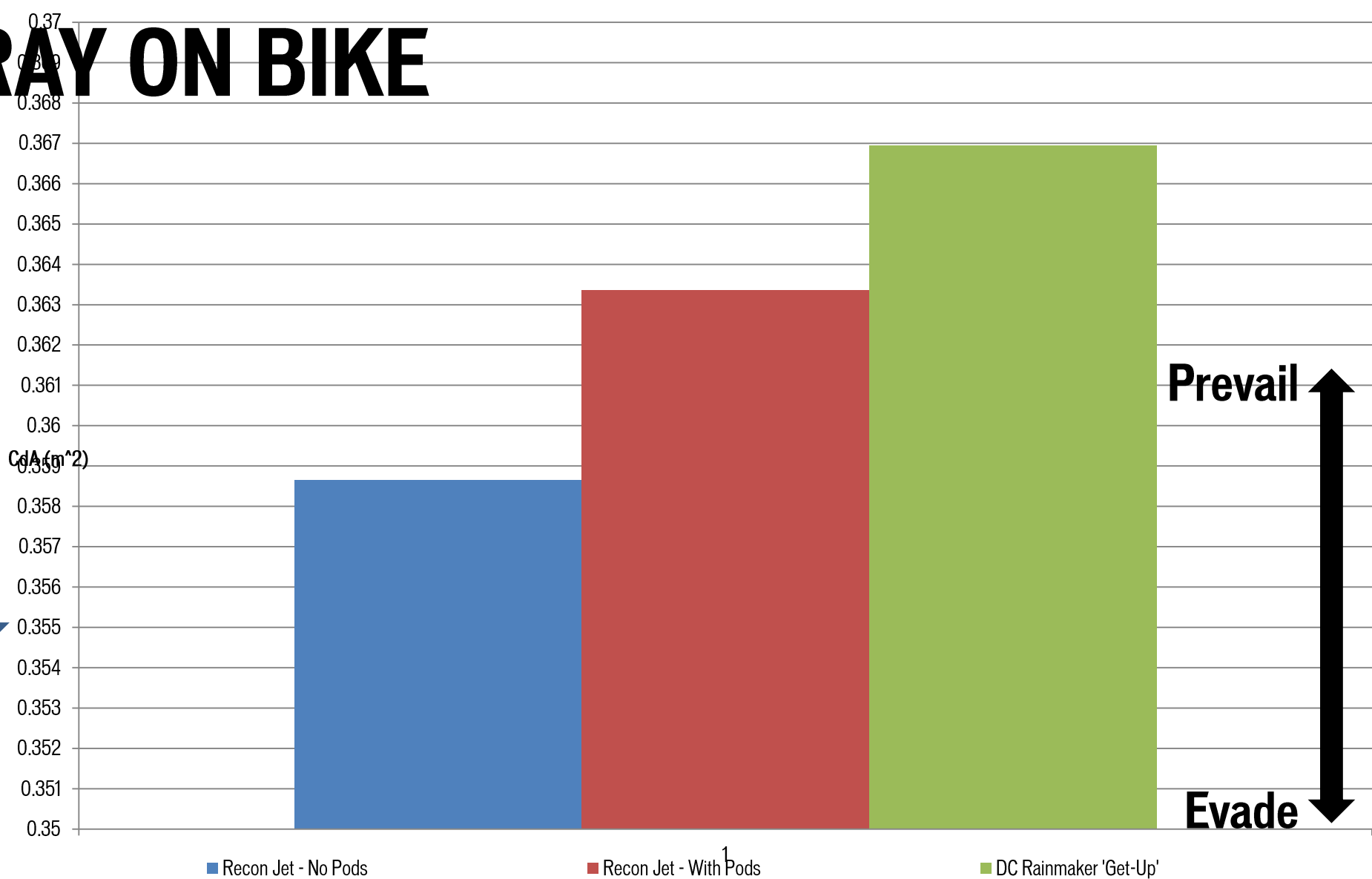
Recon Jet - with Pods



DC Rainmaker 'Get-Up'

# RAY ON BIKE

F  
A  
S  
T  
E  
R



# RESULTS & TAKE AWAYS

- Tested the following:
- Ray with Recon Jet glasses (without the pods) - this is the baseline with a Garmin 520 mounted up front.
- Ray with Recon Jet glasses (pods mounted).
  - The addition of the pods were 19 seconds slower over 40km, or roughly 4 watts at 40kph.
- DC Rainmaker 'Get-Up' with four Garmins (two mounted on handlebars - Garmin 1000's, one on stem - Garmin 810, and one on mount - Garmin 520), two GoPros mounted below stem (GoPro Hero4 Session and GoPro Hero4 Silver Edition), and the Recon Jets.
  - This set up was 33 seconds slower over 40km compared to baseline. This is equivalent to roughly 8 watts at 40kph.
- *The error of this test (rider's repeatability) was +-8 seconds over 40km.*

# ADDITIONAL NOTES

- Upon further examination of the GoPro mounting screw test, the *mount must have slipped a little bit*. It would be in my best guess that there would be no difference between mounting screws.
- The testing results that were documented in this report are very similar to previously found results. The cameras and Garmin head units are very small (in terms of surface area), which shows the tightness of the results. With a *clean cockpit set up (void of cable housing - like on the Venge ViAS)*, there is a chance that these results would be magnified, but the deltas between each set up would be similar.