

Members took 99% of Capital Bikeshare's e-bike trips, and other insights from the data

BICYCLING By **Mark Sussman** (Contributor) November 14, 2018  10



[Capital Bikeshare Plus electric assist bike](#) by BeyondDC licensed under [Creative Commons](#).

In early September 2018, Capital Bikeshare launched its CaBi Plus electric-assist pilot, introducing 80 black-painted bikes that give you a boost while you ride. The pilot is slated to run through the end of the year, and since we're approximately at

the halfway point, now is a great time to dive into the data and see how the pilot is going.

CaBi provides public trip data each month that distinguishes CaBi Plus trips by bike number, which is how I was able to parse out the pedal and e-assist bike trends. For the purposes of this article, I refer to the traditional red CaBi bikes without the electric-assist as “CaBi Classic.”

CaBi Plus bicycles are twice as popular as the CaBi Classics

Trips Taken	CaBi Classic	CaBi Plus	% CaBi Plus
September*	268,085	10,921	3.91%
October	329,224	13,797	4.02%
Total	597,039	24,718	3.98%

*September stats start on the 5th when the CaBi Plus pilot starts

The table above shows that CaBi Plus trips remain largely consistent across the first two months of the pilot and increase slightly in October, which is the first month we have full data about the pilot.

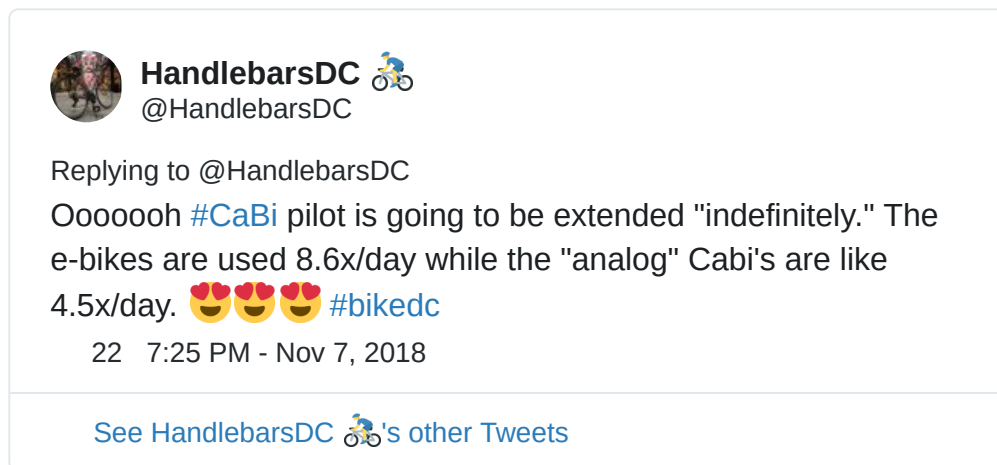
The percentage of CaBi Plus trips is impressive for two reasons. First, CaBi Plus bikes represent only 2% of the total CaBi fleet, but 4% of trips.

Secondly, the number of CaBi Plus bikes used month-over-month actually decreases from 82 in September to 79 in October. In other words, CaBi Plus trips are overperforming by 100% in proportion to the number of bikes in the fleet, and improved on that number in October even with three less bikes.

Are they really *twice* as popular? There are a few ways to slice the data

DDOT has taken notice of the CaBi Plus pilot’s popularity. At the DC Bicycle Advisory Council meeting on November 7, DDOT announced that the CaBi Plus

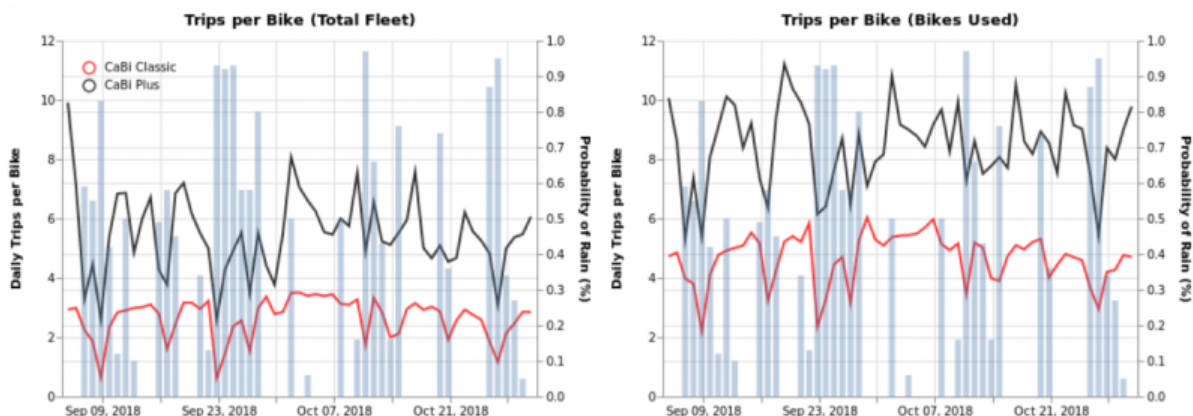
pilot would be extended indefinitely, citing the relatively high average CaBi Plus trips per bike per day compared to CaBi Classic.



At first blush, these numbers seem reasonable and tell a simple story—CaBi Plus is twice as popular CaBi Classic. But when I went to replicate these numbers, I calculated much lower numbers: 5.5x/day and 2.6x/day respectively. How could this be?

It turns out that the DDOT-cited statistics were calculated based on the number of CaBi bikes ridden at least once per day, which does not take into account CaBi bikes that were available but not ridden on a given day. I calculated the denominator by determining the lifespan of each bike and including it regardless of whether or not a trip was taken.

The graphs below compare my methodology (Total Fleet) with DDOT's (Bikes Used) overlaid with the probability of precipitation, which I've found to be the the strongest predictor of ridership.



Regardless of methodology, the graphs above show that CaBi Plus is extremely popular when compared to CaBi Classic. However, the “Bike Used” methodology, shown on the right, inflates the statistic overall, while muting the impact of exceedingly high demand (i.e. start of the pilot) and low demand (i.e. bad weather). This calculation discrepancy has a greater impact on CaBi Plus, since the pilot has only 80 bikes compared to over 4,000 CaBi Classic bikes.

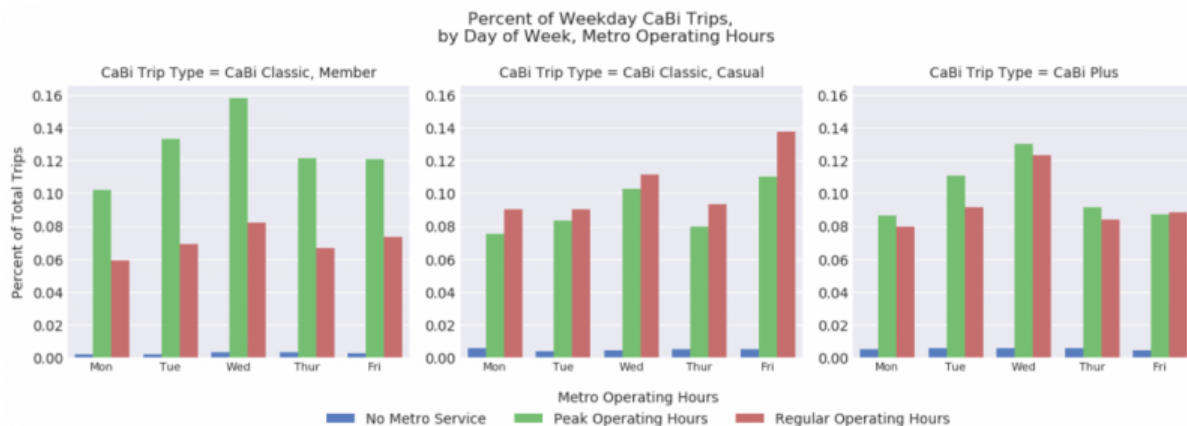
CaBi members are hogging the CaBi Plus bikes

	CaBi Classic		CaBi Plus	
	Member Trips	% Member Trips	Member Trips	% Member Trips
September*	221,811	82.7%	10,920	99.9%
October	275,762	83.7%	13,635	98.8%

*September stats start on the 5th when the CaBi Plus pilot starts

Historically, CaBi members take approximately 80% of all CaBi trips, which bears out in the CaBi Classic trips during the pilot shown in the table above. CaBi Plus trips, however, are being completely dominated by members—in September, only *one* CaBi Plus trip was taken by a non-member!

Non-members fared slightly better in October: they were able to take 162 trips, which is still a mere 1.2% of total CaBi Plus trips.



The graphs above try to explain this member monopolization phenomenon. They compare the percent of weekday trips for CaBi Classic trips taken by members, CaBi Classic trips taken by non-members (casual), and CaBi Plus trips regardless

of member type broken out by metro operating hours—peak, regular, and no metro service.

We can see that the majority of CaBi Classic trip taken by members are taken during peak metro hours, i.e. morning and evening commute. CaBi Classic trips taken by non-members are more evenly split between peak and regular metro hours (except on Friday due to “early weekend” activity).

CaBi Plus trips resemble CaBi Classic trips taken by non-members much more than by CaBi Classic trips taken by members, even though 99% of CaBi Plus trips are taken by members! With this additional data point, we can conclude that demand for CaBi Plus is so high among CaBi members that they are changing their behavior for the opportunity to ride one.

Scarcity is also likely part of the equation; there are only 80 CaBi Plus bikes spread over more than 500 CaBi stations. During the pilot period, non-members start 50% of their trips at 41 stations, while members starts 50% of their trips at 81 stations. With such a high concentration of non-member trips, it's less likely that a non-member would have the opportunity to ride a CaBi Plus bike.

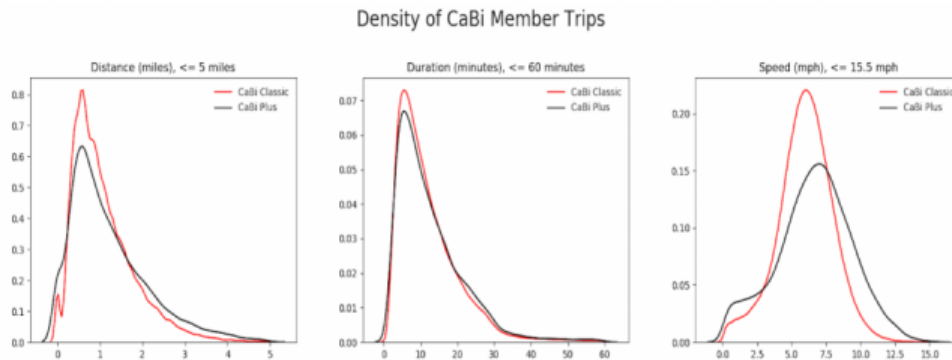
CaBi Plus trips go further, longer, and faster

	CaBi Classic	CaBi Plus
Avg Duration (min)	13.8	17.0
Avg Distances (miles)	1.1	1.3
Avg Speed (mph)	6.0	6.6

Note: statistics only include member trips

The table above shows that CaBi Plus trips on average take longer and go further at a higher speed than CaBi Classic trips. These figures were calculated for member trips only, since members overwhelmingly take CaBi Plus and I wanted to make the baseline for comparison as relevant as possible.

While these figure are interesting, averages often don't tell the whole story.



CaBi Plus and CaBi Classic have similar distributions for distance and duration, though CaBi Plus' distributions are shifted more to the right. This comparison shows that only CaBi Plus bikes are used for trips between four and five miles and there are more CaBi Plus trips of 20-30 minutes.

This analysis is most interesting when we combine distance and duration to calculate speed in miles per hour. Average speeds for CaBi Classic trips max out at about 11 mph, while CaBi Plus trips max out at about 13 mph.

There is also an odd kink in the CaBi Plus curve showing very low speeds. This could represent the pilot's growing pains, such as operational challenges of keeping bikes charged.

What are you curious about?

Be on the lookout for periodic posts about CaBi Plus. I'll be making updates to the analysis conducted here and explore additional aspects of the pilot.

What would you like to know about the CaBi Plus pilot?

Continue the conversation about urbanism in the Washington region and support GGWash's news and advocacy when you [join the GGWash Neighborhood!](#)

Tagged: [bicycling](#), [capital bikeshare](#), [e-bikes](#)



Mark Sussman is a DC resident and urban mobility advocate who has been a bicycle commuter in DC for over 12 years. An experienced data analyst, Mark recently earned a graduate certificate in data science from Georgetown and is passionate about applying this skill set to tackle urban mobility problems. When he's not traversing the greater DMV in search of the area's best disc golf course (DC proper has zero!), you can find him on Capitol Hill where he lives with his wife.

10 COMMENTS

[THREADED](#) [NEWEST AT BOTTOM](#) [NEWEST AT TOP](#)

[guest1](#) on November 14, 2018 at 12:15pm

"in September, only one CaBi Plus trip was taken by a non-member!"

This is incorrect. I had 4 guests visiting in September. They each took 4 separate rides, nearly all of them on CaBi Plus

[REPLY](#) [LINK](#) [REPORT](#)

[LB](#) on November 14, 2018 at 12:27pm

Thanks for the info. Love any reporting on ebikes, public and private.

[REPLY](#) [LINK](#) [REPORT](#)

[mjc](#) on November 14, 2018 at 12:55pm

It will be interesting to see how much this is scaled up when we get past the pilot period, as well as what the pricing structure will be.

[REPLY](#) [LINK](#) [REPORT](#)

[Jasper](#) on November 14, 2018 at 2:17pm

Do we have data on bike reliability?

Personal observation suggest there are a lot of broken e-bikes.

[REPLY](#) [LINK](#) [REPORT](#)

[Mark Sussman](#) on November 14, 2018 at 2:27pm

Unfortunately not. As of now, CaBi does not provide charging status of the bikes. There is promise of "next-gen" CaBi Plus bikes coming in the new year, so that may change.

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mjc on November 14, 2018 at 2:27pm

I assume the issue is mainly that because there are so few and they're in use so much the batteries die fast; I doubt it's a physical issue with the bikes. With an adequate fleet of ebikes the batteries would probably hold up.

[REPLY](#) [LINK](#) [REPORT](#)

Eric on November 14, 2018 at 4:17pm

Cabi Plus bikes are not available for rental to casual members through the kiosk, only through the app.

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MD2DC on November 15, 2018 at 9:37am

It makes a lot of sense to me in practice why members have logged most of the rides on CaBi+ bikes. Those bikes don't sit idle for long and I know I wouldn't be able to get through all of the prompts on the kiosk as a non-member before someone else snatched it up. Even as a member, the only time I've ever been able to catch one of them is if I'm walking up to a dock at the exact time someone is dropping one off. Low supply and high demand means that expedience is key, and non-members can't just walk up to a dock and take a bike in 3 seconds like members can.

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guest2 on November 15, 2018 at 10:33am

+ bikes are only available to members, you are considered a member if you use the app. The only users classified as casual in this data are those who purchased through the kiosk where +bikes are not available for rent.

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Member on November 15, 2018 at 1:43pm

I will gladly put forth the information that the times I have gotten a CaBi plus, I have gone way farther than just the distance to the dock I am going to because the bikes are a lot of fun to ride. Take the detour up Capitol Hill to Navy Yard to see how well the bikes perform.

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