

AV

We spent two days riding Waymo's driverless taxis and it felt surprisingly normal

From the app to the riding experience, here's our take on Waymo's robotaxis, which are publicly available in the Phoenix, AZ, suburbs

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Ryan: “Look at this, it’s like a bear hat.”

Rider Support (via intercom): *laughs* ... “Oh, wow.”

Ryan: “Yeah, I don’t know what the person before me was doing with this.”

That exchange was the only small talk in my fifth taxi ride of the day. Save for the rubber bear hat/mask left behind by a previous rider, my 5.1-mile, 15-minute trip was uneventful. As a courtesy, I reported the lost item to the taxi company’s “rider support” team.

Other “drivers” in the taxi network were likely nearby, but they couldn’t have helped. And along with her coworkers, the Rider

Support interlocutor was miles away. She appraised the lost-but-now-found bear mask through a passenger-facing fisheye camera, listened via in-vehicle mics, and responded through an intercom system.

If you haven't caught on already, the driver wasn't a person. It was Waymo "Driver"—a technological stack that's been under development for 12 years.

Bearmaskgate was the most memorable of 10 robotaxi trips across 2.5 days in Chandler and Tempe, Arizona. Most rides were smooth and unremarkable, besides the glaring exception that no one was ever behind the steering wheel.

Where the wild Waymos are

Waymo first opened Waymo One, its robotaxi service, to the general public in December 2018. But it didn't offer fully driverless rides to the public until last October. Today, its Arizona fleet—composed of Chrysler Pacifica Hybrid minivans—is likely more than 300. Waymo One runs 24/7, providing hundreds of weekly rides across a 50-square-mile swath of suburban Phoenix (slightly larger than San Francisco). Waymo's *testing* zone is double the ride-hailing area.

Besides one character you'll meet later, few regular Waymo riders have publicly documented their experiences for the world to see.

With a plan to rectify that through email newsletters, the Brew touched down in Phoenix Sky Harbor in late June. My rules of engagement:

1. Don't prearrange rides with Waymo.
2. Book directly through the public-facing app. Waymo One rides are fully autonomous and driverless.
3. Red-team (i.e., test the limits of) the technology to the extent it's safe to do so.
4. Record and observe everything. Take copious notes.
5. Bring a more discerning, skeptical lens to the experience than the newsletter writer who [came before us](#).

There's a (limited) app for that

If you're a US-based smartphone user, you can download Waymo's app. But just because you *can* doesn't mean you should.

The app's core functionality—hiring robotaxis—only works in a

“service area” that extends across parts of Chandler, Tempe, and Mesa, AZ. This, to my knowledge, is the only place in the US where robotaxis are actively picking up customers on public roads without a safety operator riding shotgun.

Post-download, users are greeted with a message from Waymo: “We’re fully autonomous in Metro Phoenix.” That’s a generous territorial interpretation, as coverage is limited to a small suburban part of the city. See for yourself:

Ryan/Waymo

The app’s first order of business is to check your location. You won’t be able to hail a ride from outside the Service Area’s hard

geofence (i.e., virtual perimeter). So, to recap...

Step #1: Be inside the Service Area.

Step #2: Input destination.

Step #3: Select your pickup and drop-off locations.

Waymo has the Service Area’s major corridors, neighborhood drives, and shopping malls mapped to a T. Down to spots and rows in a parking lot, users can surgically select where they’d like to be picked up and dropped off. The precision is a double-edged sword, though, because the vans don’t just stop anywhere. They have strict marching orders to pull up only where it’s legal (as determined by the government) and safe (as decided by Waymo).

Negotiating drop-off and pickup is give-and-take. It’s really just

take. Waymo does not give. An Uber, Lyft, or taxi driver may be willing to drop you off in a fire lane, but Waymo won't. If your exact location isn't available, you'll have to accept a nearby spot and an additional walk.

The Waymo app walks and talks like standard ride-hailing services. You get a fare estimate, route overview, and your Driver's ETA.

- Waymo says ETAs typically range from 5–10 minutes, but that rush-hour/high-demand wait times can be much longer. My longest wait (when I called at 5:30 PM) was half an hour; Another rider told me he once waited 50 minutes.
- Across the trips I cross-referenced with quotes from Uber/Lyft, Waymo fares were on average ~10% more expensive.
- Wait times were generally comparable, but for a few rides, it looked like Waymo would have beat the nearest Uber or Lyft to the punch.

Putting on the app reviewer hat

This is the carousel of info that's flashed to new riders:

What I liked:

1. There's confetti when you book a ride (*à la* Robinhood, but without gamifying option trading).
2. From the app, you can change the two-letter code and color on your car's windshield display ID.
3. While waiting on your van, the app will tell you when it's at a red light, and as soon as it turns green, so does the animation.
4. The app supports multi-stop trips.

My critiques:

1. The finicky pickup and drop-off selection process, which I explained above.
2. Sometimes, the car wouldn't show up in the app's map until it was close (a minor gripe, to be sure).
3. After any ride, the app aggressively solicits feedback. Not only does it request a one-to-five star score, it also asks you *why* you are giving that rating.

Feature request: It gets lonely for a solo rider in there, and Waymo Driver does not have the gift of gab. @Waymo, can you make the cars respond to questions? Hopefully it's not too much multitasking. Maybe it's only a matter of time until the vans get Google Assistant?

A final note: Sized-up against its siblings Google and YouTube, the Waymo app rightly feels like an experiment in beta. It has 69 ratings (nice) on the App Store (avg. rating = 4.5 stars), and ironically, fewer ratings in the Google Play Store (eight total, avg. rating = 4 stars).

- The App Store doesn't disclose downloads. App Annie, a third-party analytics service, told me the Waymo app had 60,000 cumulative iPhone downloads as of June 2021.
- The Play Store lists Waymo installs at 50,000+. YouTube, by comparison, is at 5,000,000,000+.

Coming in hot

Waymos may be a common sight for Service Area residents and motorists, but they're shiny spectacles to the untrained eye. The vans are coated in a glossy, well-maintained white enamel and protrude with sensor equipment. A whirring lidar puck is the cherry on top (it's literally positioned at the uppermost part of the van).

That's the first impression from a distance. Before a human can make out the empty driver's seat, the car has made hundreds of calculations and moved even closer.

To sum it up: The first time you encounter a driverless vehicle on public roadways, it's pretty surreal.

But we're not here for the spectacle. If you somehow missed that your car has arrived, Waymo's companion app notifies you. The van uses your phone's location and Bluetooth to unlock the doors once you're near. Step inside, shut the automatic door, and fasten your seatbelt.*

- *In Ride #1, due to a combination of excitement and human hubris, I didn't immediately buckle my seatbelt. Rider Support, monitoring the situation**, came over the intercom, and asked me to plz fix.
- **The in-car camera (and microphones) raise privacy concerns, especially given Google's track record. Waymo says Rider Support doesn't continuously monitor the in-vehicle

cameras, which are only activated during emergencies or "safety" incidents.***

- ***From the vehicle or app, if you call Rider Support mid-trip, they answer within seconds.

So, you've entrusted your life to a machine

You start the ride by hitting a button on the pair of headrest-mounted touch screens, your van's overhead control console, or within the Waymo app. What next?

1) The wheel comes alive: Driver creeps to life. If the vehicle has to navigate a crowded parking lot in peak hours, it proceeds cautiously but steadily. In sparser settings, Driver more immediately accelerates to confident cruising speed, providing a narrow cushion between itself and parked cars or other obstacles. It hugs corners on tight 90° turns.

2) All gas: In short order, you'll find yourself turning out onto a bigger, faster public road. Driver doesn't wait for zero oncoming traffic to take an unprotected right. On a three-lane road, for example, the car will take the rightmost lane even if traffic is coming in the middle and left lanes.

- Acceleration was one of the biggest surprises. Coming in, I expected the vehicle to treat the gas pedal like a driving school student would. It did not, and would quickly accelerate to 45 mph.

3) The brake is your best friend: Braking was smooth overall—the jerky, sudden exceptions to this rule occurred at lower speeds. More on this in the “oopsies” section.

4) Sharing the road: Driver basically moves with the ebbs and flows of surrounding traffic. It won't tailgate, nor will it maintain

seven car lengths of distance. The motorists sharing the road with my Waymos seemed largely unfazed by the vehicles at this point.

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5) Maneuverability: Driver can weave between lanes just fine, but it also doesn't change lanes unnecessarily. I was very impressed by the vehicles' ability to take unprotected left turns (i.e., without a green arrow).

6) Routing: The system plans longer routes to avoid difficult situations. For example, if Driver comes up on an intersection where it doesn't like the left turn option, it will go through the light and plan three right turns as a workaround. My vans also frequently defaulted to calmer neighborhood routes rather than bustling, faster roadways. Waymo says routing practices are done with a variety of variables in mind—traffic, construction, Waymo Driver's capabilities—but that safety is the biggest consideration.

- Waymo Driver *can* go on highways (as do [Waymo Via's trucks](#)), just not the vehicles in Waymo One's fleet.

7) I really buried the lede here: The question on all your minds is whether the experience feels safe. The answer, in my view, is a resounding yes. The human in me was inevitably unnerved when first climbing into a driverless car. The rationalist in me quickly

came around. Riding with Driver takes on a sense of normalcy. The wheel spinning itself never gets old. But rides, I daresay, can get a bit boring.

- In October 2020, Waymo published a [safety report](#) analyzing 6.1 million miles of autonomous driving data from Phoenix. The report dissects 47 "contact events," 18 of which occurred IRL and 29 that happened in simulation.
- Most collisions were rear-fender benders. "Nearly all" were the fault of a human, according to Waymo, and none produced "severe or life-threatening injuries."
- Waymo's braking tendencies may have played a role in a couple crashes involving its vehicles, per [police reports](#) obtained by the Phoenix New Times earlier this year.

8) Oopsies: Driver ain't infallible. I bore witness to infrequent erratic behavior. To wit, three examples:

- I had just started a trip outside of Chandler Fashion Center (*always* dress to impress). A car was (illegally) parked in a fire lane with hazards on. As Waymo prepared to make its pass, the car's owner inched out from behind its bumper and gave the impression she would shimmy between the two vehicles. The van lurched to 0 mph real quick, inducing an oh-so-tiny moment of whiplash. Post-full-stop, the wheel spun to the left, Driver carved a wider path and continued onward.
- A bus ahead of us began slowing and drifting along a divider between two lanes. Waymo generously braked in the intersection, quickly shaving off ~50% of its speed. Once the bus driver's intentions to peel off became clearer, Waymo took the lane to the bus's left and sped by.
- My Arizona trip was right before July 4. In some parking lots, fireworks vendors had erected makeshift tents with a perimeter of traffic cones surrounding them. In one trip, Driver was circling a lot's outer edge and making a final end run to the drop-off. Just one problem: It had to pass through an ultra-narrow berth between a fireworks stand and the curb. The car laid on the brakes after inching toward the slot. The fireworks vendor manning the stand, named Austin, stood up, approached the car, and watched on curiously. After a few seconds, the car glided through the ~7.5-foot berth without incident. Afterwards, Austin told me he was surprised by how the van negotiated the scenario.

For a fleeting moment near the fireworks stand, I thought Driver would have to phone home for help. Or be forced to put it in reverse, extricate itself from the situation, and find a new drop-off. But across all ten trips, I never got stuck. There weren't any trip interruptions or situations in which Waymo Driver had to pull over.

9) Red-teaming: After two trips, I walked in front of my vehicle to see how it would react. The van wasn't having any of it and didn't fall for my trap. It would stop as soon as it looked like I might move in front of its route. Each time, the van then moved around me and went on its way.

10) Emergency vehicles: During trip #8, a fire truck with sirens on had to pass us. Along with the few vehicles around us, I was stopped for a red light that had just turned green. The car did not

move until the fire truck had gone through the intersection, so it was a relatively easy test.

- Waymos are programmed to handle encounters with emergency vehicles. They follow the law, give the right of way, and, if they're being pulled over, roll down the windows so first responders can communicate to Waymo's operations team.
- For more details, Waymo has [published protocols](#) for first responders to understand how its vehicles handle law enforcement interactions.

11) Feedback is a gift: If you don't provide a five-star rating after a ride, the Waymo app asks what could've been improved. The options are a tell for what kinks are still being ironed out:

- "pickup"
- "wait time"
- "got stuck"
- "route"
- "too cautious"
- "uncomfortable driving"
- "autonomous specialist"
- "other" (free-form response)

12) The elements: Since returning home, I pulled up Waymo's app because I had separation anxiety, and I saw an announcement: "Autonomous specialists are temporarily accompanying rides, which means someone will be in the driver's seat." I checked the

weather, and sure enough, the National Weather Service had issued a Flash Flood Watch for Central Arizona.

- TL;DR—Waymo's driverless cars don't run in inclement weather. You can still use One, but the vehicles will have safety drivers.

A more authoritative POV

I was under no pretense that I could parachute into Arizona for a few days and emerge an expert on Waymo One. So I called up Joel Ricks, a seasoned Waymo rider, to cross-reference my notes with his. The Chandler-based college student has taken 160+ rides in Waymos across ~1,200 miles, and he's [detailed everything on his](#)

[website](#) for the world to see.

Ricks cites unprotected left turns and crowded parking lot navigation as the biggest improvements he's noticed over time.

- Waymo “used to wait and be a lot more hesitant” with unprotected lefts, Ricks notes, which are “pretty much flawless now. ...If there's a gap, and [the vehicle] knows it's safe and can calculate everything, it will just go for it.”
- Navigating busy parking lots used to mean “lots of whiplash, braking, and in some cases, disengagements. ...Now, there's a lot more smoothing out and it feels a lot more confident.”
- The in-vehicle experience has stayed fairly consistent, with the exception of a plastic visor that was installed in vehicles during Covid times.
- His YouTube channel contains plenty of diamonds in the rough, such as a [Waymo interacting](#) with a cop who's directing traffic with hand signals.

Ricks is far from a passive rider and he's a much better red-teamer than me. He'll deliberately select dicier pickups, drop-offs, and routes, with the goals of getting his Waymo stuck and noticing how/if Driver behavior has improved over time. He's observed that Waymo has removed more difficult pickup and drop-off spots. “That just feels like cheating to me,” Ricks says.

One of Ricks's [most viral, headline-making YouTubes](#) came in May, when his Waymo glitched in a construction zone, blocked traffic, and continuously behaved erratically. In the video, he calls Rider Support, who dispatches a Rider Assistance team to extricate the vehicle. But suddenly, his Waymo starts to move again, giving the impression that it's evading the team sent to retrieve it.

Mind the caveats; Think of the wider context

In a nutshell, that's the takeaway from my pilgrimage to the cutting-edge of real-world driverless operations.

No matter how much you try sweet-talking your stoic, self-spinning steering wheel, Driver won't be taking you beyond the Service Area's perimeter. It won't take you on a freeway (for now), nor pick you up during signature regional dust storms. There are substantial costs that come with maintaining a 700+ vehicle fleet, employing support staff, and funding R&D advancements (like the [fifth-generation](#) Waymo driver). In a round led by Alphabet, Waymo recently raised \$2.5 billion, on top of a \$3.2 billion haul last June.

These are but a taste of the many variables determining the most important question of them all: Can autonomous driving be safely and cost-effectively generalized beyond suburban Phoenix? Or downtown San Francisco, the one place contesting Phoenix for the unofficial title of US self-driving capital?

Plenty of engineers, executives, and investors still believe the answer is yes. It's impossible to say whether full-feature Level 5 autonomy is solvable. But the minimum viable product exists today, in the form of Waymo One's Level 4 cars. The minivans still have more driving edge cases to work out. And if they want to bring a viable business model to the general public, the minivans' minders also have to work out the more trivial situations, like what to do when one rider finds another's bear mask stranded in the robotaxi.

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