

# Waymo's Self-Driving Cars Are Near: Meet the Teen Who Rides One Every Day

**B** [bloomberg.com/news/features/2018-07-31/inside-the-life-of-waymo-s-driverless-test-family](https://www.bloomberg.com/news/features/2018-07-31/inside-the-life-of-waymo-s-driverless-test-family)

Alphabet is experimenting with prices and finalizing its business model before unleashing its autonomous fleet in Phoenix this year.



Samantha Jackson, right, and her daughter Kyla, 17, with a Waymo autonomous vehicle. The Jackson family has volunteered to be part of Waymo's Early Rider program in the Phoenix area.

Photographer: Caitlin O'Hara/Bloomberg

For the past year, Kyla Jackson has been one of the only teenagers in the world who gets a ride to high school from a robot.

When she's ready to start her day, Kyla summons a self-driving car using the Waymo app on her phone. Five minutes later a Chrysler Pacifica run by the autonomous vehicle arm of Google's parent company, Alphabet Inc., stops at her home in Chandler, Arizona. She slides open the door, fastens her seat belt, and hits a blue button above her head to set the car in motion. It's a minivan covered in goofy-looking sensors, but it's the coolest ride at her school.



Kyla Jackson demonstrates the passenger controls.

Photographer: Caitlin O'Hara

The Jackson family, along with some 400 neighbors in their Phoenix suburb, are volunteers in an ongoing test of Waymo's autonomous ride-hailing business, which is expected to launch for paying passengers in the area by the end of the year. The Jacksons, who Waymo made available for this story, have largely ditched their own cars and now use self-driving vehicles to go almost everywhere within the 100 square-mile operating area: track practice, grocery shopping, movies, the train station.

Kyla acts like a diva with a private chauffeur, laughs her mom, Samantha Jackson, in an interview in Chandler last week. Access to robotaxis has even managed to convince this 17-year-old to put off an American rite of passage: getting her driver's license. As Kyla puts it, "What's the point?"

All rides are free for volunteers, but the Waymo app recently started to show hypothetical prices. A view of the app by Bloomberg News offers the first indication of Waymo's early experiments with pricing. A ride to Kyla's nearby school shows up as \$5, for example, while a longer 11.3-mile trip lists a cost of \$19.15. That's similar to the cost of a ride from Uber Technologies Inc. or Lyft Inc., and cheaper than a local taxi.

A Waymo spokesperson says the placeholder price is a way to solicit feedback from volunteers and "does not reflect the various pricing models under consideration." It's certainly got the Jackson family wondering how the service they've come to rely on will soon fit into their

lives.

“People were like, ‘I don't know how you get in that. I couldn't trust a machine like that.’ It's so opposite to how I've come to think about it,” Samantha says of friends' reaction to her family's trust in driverless cars. “I can't think of a time that we've ever been honked at.”

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Waymo's Early Rider program in the Phoenix area is the furthest along among the company's 25 test cities. The Google offshoot has logged more than 8 million miles in fully autonomous mode and is now starting to test cars in Phoenix with no backup safety driver behind the wheel, something the Jacksons have experienced just once. If the public launch is successful, Waymo would be the first autonomous ride-hailing business.

“We're just getting started,” says Waymo Chief Executive Officer John Krafcik, who spoke with Bloomberg last week at Alphabet's X lab in Mountain View, California. It's the semi-secret facility where delivery drones land on the rooftop and engineers in the garage below tinker with Waymo's next vehicle, an autonomous Jaguar I-Pace.

Krafcik's goal is to build what he calls “the driver,” an integrated suite of hardware and software that makes self-driving possible, and then to put the technology to work across four areas of transportation: ride-hailing services, trucking, personal vehicles, and public transportation. The strategy leans heavily on partnerships, especially for vehicles.

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Waymo has made a lot of moves on the first three of its four priorities. Here's where things stand:

1. **Ride Hailing:** Waymo has reached deals to buy as many as 62,000 plug-in hybrid Pacifica minivans and 20,000 fully-electric I-Pace SUVs to build out its fleet over the next few years. It's getting ready to launch the first commercial program in Phoenix and is waiting to hear back from California regulators on its application to begin testing without safety drivers in its hometown.
2. **Trucking:** Waymo has outfitted several Peterbilt Class 8 semi trucks with autonomous packages. The hardware is exactly the same as what's used on its Pacifica minivans, and Krafcik says the software is 95 percent similar. The trucks are now hauling equipment among Alphabet facilities in Atlanta, with human backup drivers behind the wheel. Waymo announced talks with Honda Motor Corp. almost two years ago, and in April indicated that the pact would focus on producing a driverless vehicle aimed at delivery and logistics.
3. **Personal Vehicles:** Waymo announced that it's in talks with Fiat Chrysler Automobiles NV to develop a self-driving personal car. Krafcik says Waymo is also in discussions with “more than 50 percent” of the global auto industry by volume, and the introduction

of self-driving cars for personal use will trail its ride-hailing service by “a couple years.”

Waymo’s fourth category is public transportation. On Tuesday, Waymo is announcing a partnership with Valley Metro, the agency in charge of public transportation in Phoenix, to begin shuttling people to and from public transportation. The program will start with Valley Metro employees and expand over time. The pact may later extend to Phoenix’s RideChoice program, which negotiates deals with taxi companies and subsidizes rates. The idea is that, if done right, self-driving cars could increase access to buses and trains in sprawling cities like Phoenix.



Waymo CEO John Krafcik

Photographer: Geoff Robins

“Personal auto mobility has changed the world in some fairly negative ways,” Krafcik says. “We can get the world back to a better place.”

That utopian vision has been undercut by the emerging impact of ride-hailing services such as Uber and Lyft on mass transit. A new report by Bruce Schaller, a consultant and former traffic-planning official in New York, found that 60 percent of app-based rides drew people away from otherwise using public transportation, biking or walking. For every mile of personal driving replaced by a ride-hailing app, customers added 2.8 miles of driving.

If self-driving cars make ride-hailing cheaper and more convenient, the research suggests, it could take a wrecking ball to public transportation. Strangely, the head of Phoenix’s public transportation agency agrees with that assessment.

“It will absolutely happen,” says Scott Smith, Valley Metro’s CEO. “But I’m not scared, I’m excited. There will be a reduction in bus use, in subway use in some areas, but expanded use in others. This is real. We’ve got to be a part of it.”

Some local bus routes are inefficient, Smith says, carrying just a few passengers in a vehicle built for 40. The partnership with Waymo could instead provide cheap connections to Phoenix’s high-capacity corridors of express buses and light rail. An autonomous car could drop you at one station, and another could arrive just in time to pick you up on the other side of the city. The problem with impact studies that have been conducted so far, Smith says, is that the data available today only captures the negative effects of ride hailing—not the benefits that could come from integrating self-driving cars combined with streamlined public transit.

The partnership between Waymo and Phoenix’s mass-transit system will last up to two years. In the next three to six months, the program will expand to include pickups for people with disabilities. The city typically spends \$25 to \$50 to subsidize those rides, and working with Waymo could be a way to cut costs and expand service.

“There are no rules other than let’s be safe, let’s learn, and let’s share data,” Smith says.



One of the sensors along the front of a Waymo vehicle.

Photographer: Caitlin O'Hara/Bloomberg

The experience of riding in a Waymo is surprisingly mundane. The robotaxi drives like a very careful human. Bloomberg News sat in the backseat, accompanied by backup drivers, for recent rides near Palo Alto and Phoenix.

Screens built into the back of the front-seat headrests give passengers a sleek, videogame-like view of what the car sees, with nearby vehicles represented as smooth pods jockeying along a dark blue virtual roadway. Every 5 seconds or so, a spray of white pinpoints flash across the screen, briefly illuminating the roadway in striking detail: pedestrians on the sidewalk, shrubbery, road signs dotting the landscape. It's Waymo's way of telling the passenger: *I've got this.*

One of the tricks Waymo has had to learn is how to indicate "intent" to other drivers by how the car moves. While making a left turn in a large multi-lane intersection, the car signals and creeps forward before accelerating into the turn. Waymo drives conservatively, to be sure, but the robots aren't cowards. Gone are the days where two self-driving cars facing each other in a parking lot might freeze up from an overabundance of politeness: *You go first. No, please, you go first.*

There are still times when the car gets flustered—Kyla says that the rush of students in the parking lot of her high school can trigger Waymo paralysis—but for the most part it's a reliable, if boring, chauffeur. "Kids walk and it halts," she says. "It's so polite. It's like, 'Oh sorry.' It's not rude enough."

Waymo vans shuttle in and out of a nondescript depot in suburban Arizona, where a handful of dispatchers manage a fleet of hundreds of vehicles. Waymo just doubled the size of its Chandler facility and will need to find more space soon. The new area of the warehouse is packed with some 50 minivans still being loaded with sensors, and one depot operator said that more vehicles arrive every week.

While Waymo's trials have proven the technology is feasible, it's only done so in Arizona's Goldilocks-like conditions of sunny weather and wide streets, says Raj Rajkumar, a computer engineering professor at Carnegie Mellon University. "The question is not just one of cost, it's one of scale," he says. "Even Waymo, with Alphabet's deep pockets, cannot do this across the country."

In California, meanwhile, Waymo has dozens of vans operating out of Alphabet's X lab to provide daytime taxi services for employees. That program, too, is up for expansion.

Waymo is coming of age at a time when Uber and Lyft have cemented themselves as the dominant brands in U.S. ride-hailing apps, but Waymo's head start could establish it as the go-to self-driving service. (Waymo entered into a partnership with Lyft in 2017, although that deal has yet to yield results.) There are ways to quantify this early advantage. California requires detailed reporting from every company testing cars there, and the results show Waymo far ahead of its competitors testing on public roads in the state. The chart below shows the number of miles driven, on average, before a human took control of the car.

Samantha Jackson, who works as a senior director of operations for Downtown Phoenix, grew up in a Michigan family that worked for General Motors Co. Her father was an early tech adopter, boasting the first personal computer of anyone they knew. Now, she says, her dad is "that senior citizen driving 55 in a 70" and she wants him to shift into self-driving cars. "I can't

wait until my dad can get in this thing. I'm so excited for that moment.”

The Waymo app updates every month or so, Samantha says, and the performance of the autonomous cars is constantly improving. Once, early on, her car stopped behind a construction container and didn't know what to do, forcing the backup driver to take over. On her first trip to the mall, she recalls the car taking “the most asinine route” and then driving all around the parking lot. Since then, she says, Waymo has designated drop-offs on the map for major points of interest.

Waymo is widely seen as the current leader in self-driving technology, and the company is poised to step first into a market that could top more than \$1.5 trillion a year by 2030, according to UBS analyst Eric Sheridan. He estimates that Waymo software will drive some 60 percent of autonomous cars by then, bringing Alphabet some \$114 billion in revenue, not including the trucking business. But these eye-opening revenue projections and the potential for widespread adoption will hinge, in part, on pricing.

The roughly \$1.70 per mile price visible to the Jackson family on the Waymo app is comparable to rates for ride-hailing options in Phoenix but less than the roughly \$2.50-per-mile rate charged by the local taxi companies. Without human drivers to pay, however, the price of a Waymo could go lower—much lower.

Tasha Keeney, an analyst at ARK Invest, says that Waymo could choose to offer an autonomous ride-hailing service today at around 70 cents a mile—a quarter of the cost for Uber passengers in San Francisco. Over time, she says, robotaxis should get even cheaper—down to 35 cents a mile by 2020, especially if Waymo's technology proves sturdy enough to need few human safety monitors overseeing the autonomous vehicles remotely. “You could see software-like margins,” Keeney says.

Self-driving rivals are also plotting their own pricing strategies. Cruise Automation, the unit of GM that's widely seen as the nearest competitor to Waymo, hasn't launched passenger tests yet but is already talking about pushing robotaxi prices down. “We see a pretty clear path to less than \$1 per mile cost by 2025,” GM President Dan Ammann said in November.

Kyla Jackson has been talking to her parents about what happens when Waymo starts charging for rides. The calculation is different for each member of the family. For Samantha and her husband, who own their own cars, the cost of taking a Waymo competes with the price of gasoline, and that's a tough sell for everyday errands. The minimum age of riding alone is 16, which means Kyla's 12-year-old brother needs an older escort. For Kyla's grandmother, who isn't in the program, it would be a bargain to be able to pick up her grandson from school and spend time with him rather than worrying about the road.

Kyla is holding out hope that her parents will subsidize her rides. Even if she keeps up her pace of using the car to go to school and work at a burger chain and parties with her friends, the Jacksons all agree that the Waymo is safer than teenage driving—as well as cheaper than owning a car and paying for insurance.

The question then is whether Kyla will get her license at all. She's in no rush, and her peers seem open to an alternative: "A lot of my friends are like, 'Oh my gosh, I wish I had a Waymo.'"

— *With assistance by Dimitrios Pogkas, and David Welch*