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From: William Riggs <wriggs@usfca.edu>

Date: Monday, October 23, 2023 at 3:53:35 PM UTC-7

Subject: Comment on Item #11, Autonomous Vehicle Update — INFORMATION

To: clerk@sfcta.org <clerk@sfcta.org>

See attached comment and supporting presentation.

William (Billy) Riggs

415.935.4512

October 23, 2023

Clerk of the Transportation Authority
1455 Market Street, 22nd Floor
San Francisco, CA 94103.
clerk@sfcta.org

Subject: Comments on “Item #11, Autonomous Vehicle Update — INFORMATION”

I wanted to take the opportunity to provide insights and perspectives related to “Item 11, Autonomous Vehicle Update — INFORMATION” based on research as professor and the Director of the Autonomous Vehicles and City Initiative at the University of San Francisco.

My academic and professional work over the past two decades has explored the potential of transportation technology. This research and policy work has focused on autonomous vehicles (AV) rider dynamics in but also established policy—for example the American Planning Association’s PAS Report 592 - Planning for Autonomous Mobility.¹ I have been one of the first scholars globally to assess travel behavior in level-4 automated vehicles and to infer how these vehicles can reduce collisions, facilitate more sustainable travel, and increase network efficiency. Given this I find myself in a unique position to speak to not only about the potential benefits of electric, autonomous and shared mobility but how they technology relates to climate goals and reducing wasted VMT on the automotive network.

Specifically, my research has shown that AV technology can fill gaps in the transportation network and compliment transit systems—better serving vulnerable populations that have traditionally been hard to reach including young people, seniors, physically disabled populations, and the vision impaired. We continue to work on concepts that explore how AVs can help better serve high-cost, high-need transit patrons globally—something that can help transit systems / operators provide more reliable and convenient services on high-capacity corridors.

Results from our rider studies, contradict suggestions about rampant VMT increase, showing that more than three quarters of trips (76.2%) would have occurred even if AVs were not available; most (55.5%) via ridesharing services.² This means that most of this travel would have existed on street networks if AVs were not operating on them. Our results suggest AVs are not increasing total travel / traffic dramatically but making it more efficient for populations that have traditionally been neglected by transit (our rider pool was 63% of nonwhite). Many want more safe, reliable options; particularly since most late-night trips were social and recreational—71.4% of trips after 10pm were for social/reaction purposes.

A recent peer-reviewed presentation this work to the American Planning Association / Association of Collegiate Schools of Planning is attached to the email accompanying this memo, and we will present update to this data set in a peer-reviewed session this coming spring to the National Academies of Science, Engineering and Medicine’s Transportation Research Board.

¹ <https://www.planning.org/publications/report/9157605/>

² https://link.springer.com/chapter/10.1007/978-3-031-34757-3_9

While these statistics are important because they show the promise of integrating AVs into public transport to better meet ADA requirements³ and explore new business models,⁴ it is important to keep in mind that many recent comments that have been reported on in the media related to in-lane stops do not take into account the economic forces that differentiate fleet models from traditional Mobility-as-a-Service (MaaS) models from companies like Uber / Lyft. Put succinctly, the business models of AV companies relate to maximizing people-capacity per VMT / VKT. AV fleets from have an economic incentive to maximize cost-recovery / money over capital invested (MOIC) & minimize wasted VMT on the network—so although there's data that exists to show that AVs have significantly contribute to decreased traffic flow, even if that were the case this would be a significant issue to the operational and business for AV companies.

Furthermore, some of our more recent work and qualitative work with riders suggests that many of the complaints about AVs in their interactions with other vehicles and first responders may be the exception vs. the norm. Our student riders have discussed many interactions with first responder vehicles but documented no issues in yielding to these vehicles. Furthermore, over thousands of rides, we have not seen the rampant unexpected stops that have been mentioned in the media. Important quotes from our work reveal a more interesting trend that suggests that rider feel that the vehicles may be increasing roadway safety as a whole. One of our recent interviewees even said that they loved that the vehicles slowed down traffic and actually obeyed the speed limit saying, "People use my street as a racetrack and AVs have slowed down traffic."

While there is still ample work and dialogue to be done in the area of automation, our research shows that AVs can provide invaluable mobility, safety and economic benefits to San Francisco and beyond. We have suggested one of the core areas that organizations like the SFCTA and SFMTA might focus on is public-private collaboration on street drop-off environments, and potentially extending Mobility Data Specification (MDS) or the Curb Data Specification (CDS) to account for in-street interactions and allow for more opportunities for dynamic data transmission between cities and the private sector. This work could lead to new ways of managing curb availability and traffic flow as well as new ways of thinking about pricing and congestion charges.

As I mentioned previously, I have provided a recent presentation alongside this memo and I'd be delighted discuss our work with you in greater depth in the future.

Sincerely,

William (Billy) Riggs, PhD, AICP, LEED AP
Professor, University of San Francisco, School of Management and Dept of Engineering
Director, Autonomous Vehicles and the City Initiative
wriggs@usfca.edu

³ <https://www.sciencedirect.com/science/article/pii/S0967070X22002116>

⁴ https://www.researchgate.net/publication/342940677_Business_Models_for_Shared_and_Autonomous_Mobility

Research Rider Pilot Project: Trip Patterns & Experiences in Autonomous Vehicles

William Riggs, PhD, AICP, LEED AP

wriggs@usfca.edu | @billyriggs

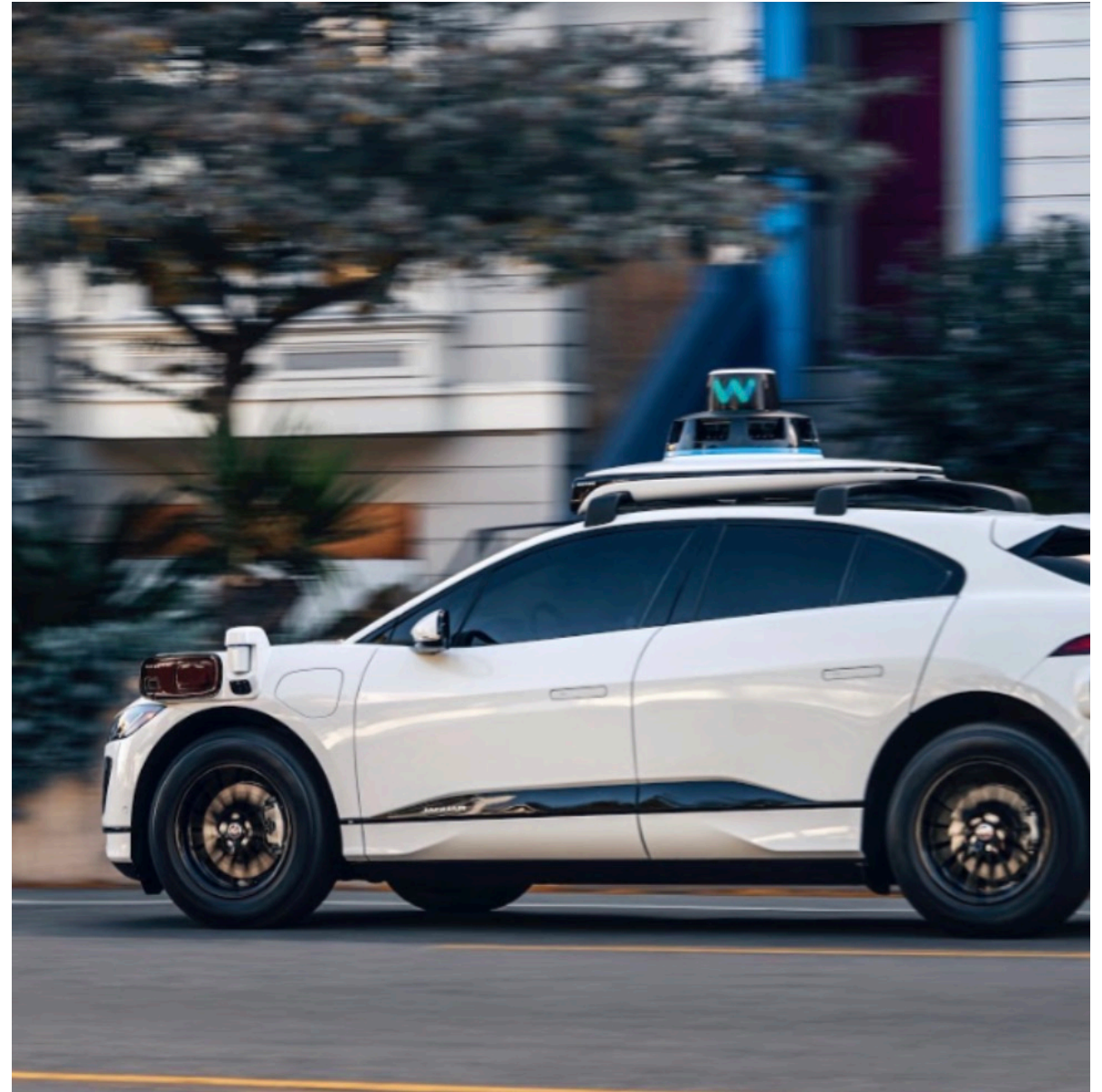
<http://dx.doi.org/10.2139/ssrn.4195380>



UNIVERSITY OF
SAN FRANCISCO



2023

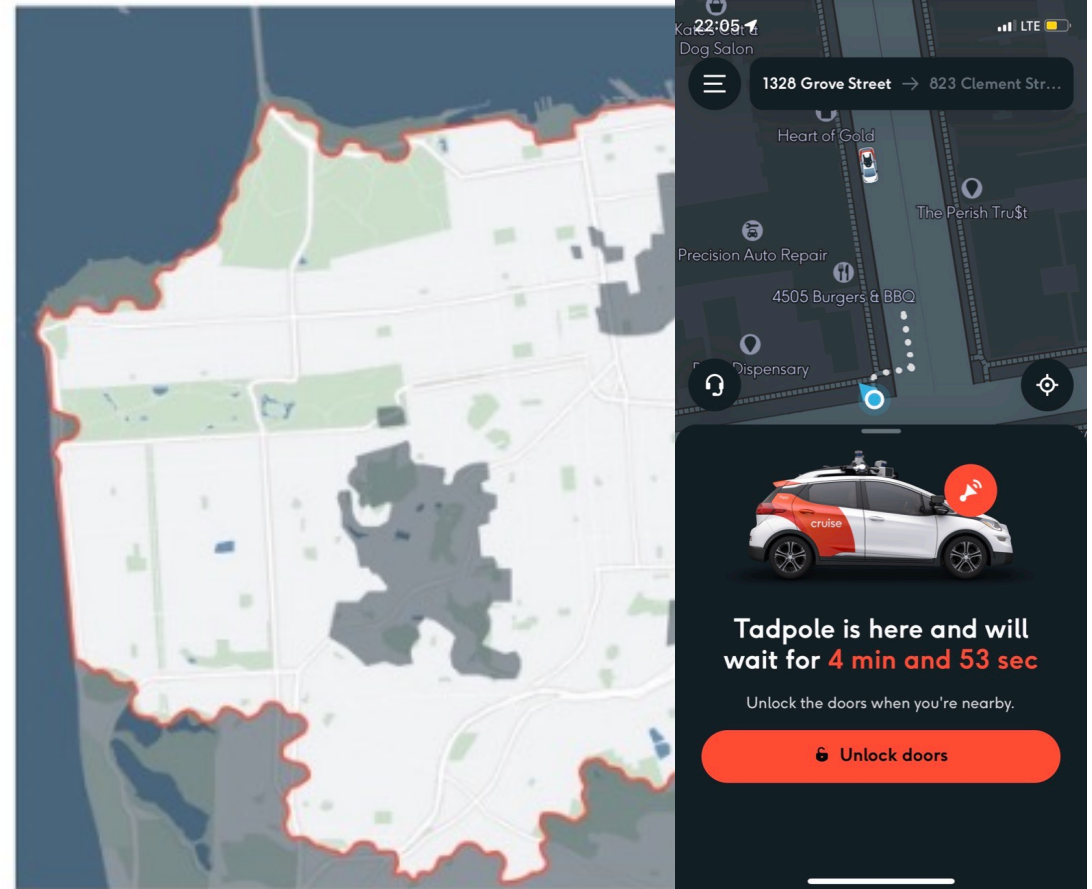


William Riggs | wriggs@usfca.edu

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An Uber Without a Driver

- No Driver in ODD
- Fully Autonomous / No V2X Requirements
- No fixed route within ODD
- On-demand, app-based
- Door-to-door “last mile” service
- User-responsive and personalizable



Fleet Characteristics (Cruise & Waymo)

- Level 4 – Fully Autonomous w/ no V2X or off-board data required
 - Generalizable software stack bundle with cameras, LIDAR, radar, etc.
 - Sensor derived, OEM developed 3D/HD maps (non-crowdsourced) on-board w/ resolution from ~10-100cm
- ~300 Vehicle Robotaxi Fleet per City; 3-4 City Deployments
- Roughly 3-5 vehicle to each customer support representative; **no teleoperations**
- Fully EV Fleet w/ Central Charge Stations
- Intention to Pursue Shared Platform (Waymo Zeekr & Origin)

2023

Transportation

Cruise to begin testing Origin robotaxis in Austin in coming weeks

Kirsten Korosec @kirstenkorosec / 8:26 PM GMT+1 • March 14, 2023

Comment



Image Credits: Screenshot/GM

Cruise, the self-driving unit under GM, is rolling out its custom-built Origin robotaxi on Austin's public streets in the next several weeks, CEO Kyle Vogt said while onstage at SXSW.



In this 1968 movie, Herbie the VW Beetle's adventures include Lombard Street and the Golden Gate Bridge.

A » Knight Rider

B » Batman

C » The Love Bug

D » Bumblebee

Trip map

Trivia home



Carrot
Car

11:02 PM
Arrival

823 Clement Street, San Francisco, CA 94118
Destination

Green Earth

Chico Fico

Saffron Grill

Grove St

Scott St

The Independent

1 min away



Arriving soon

Tadpole · 10787J3



Pickup reminders ▾



Your trip

Share

Cancel ride

5

Cruise & USF Piloting Riders

Cruise is an **all-electric, shared, and self-driving** car service headquartered in San Francisco founded in 2013. GM became majority owner in 2016.

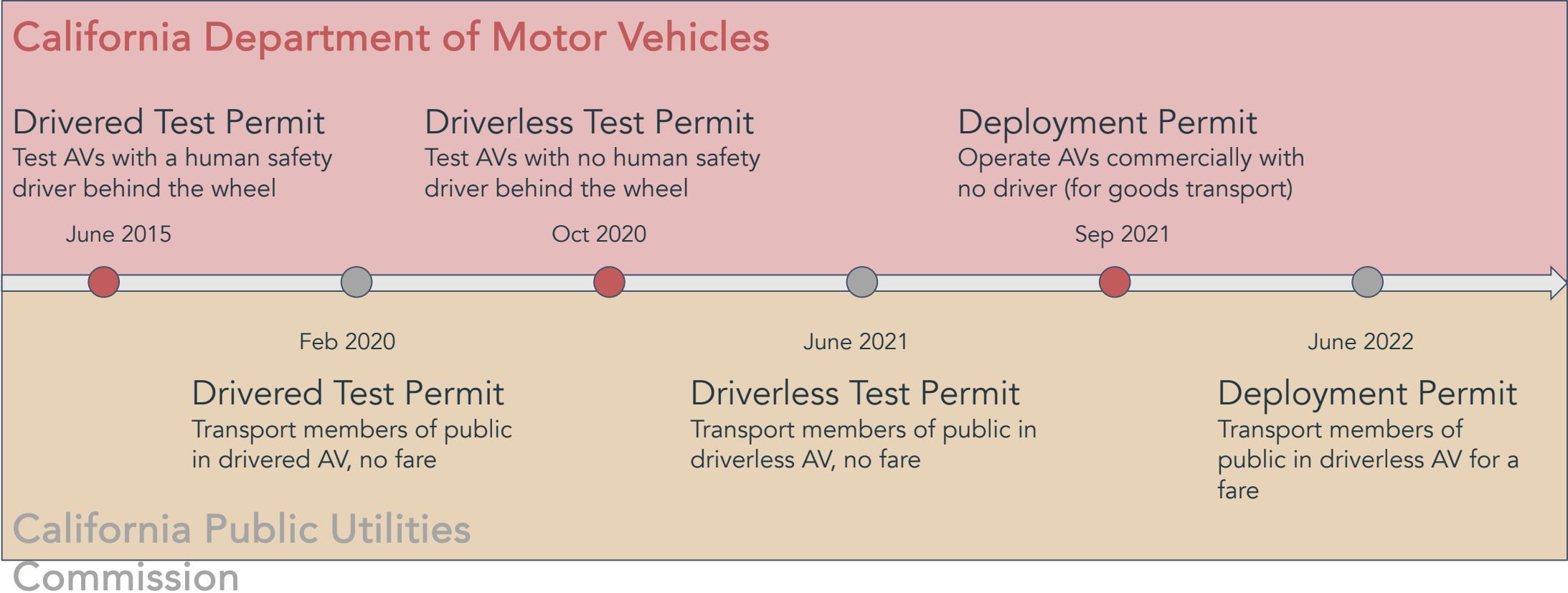
In June 2022, **Cruise** received its sixth and final permit in California to offer driverless service for a fare in an approved ODD.

Prior to this launch, in March 2022, the **University of San Francisco** AV City Initiative began an independent investigation of pilot student riders.



Cruise Regulatory & Safety Progress

Over the last 7 years, Cruise has received six total permits from the CA DMV and CPUC, each of which has afforded Cruise incremental flexibility in deployment, and in creating programs like the Research Rider Pilot.



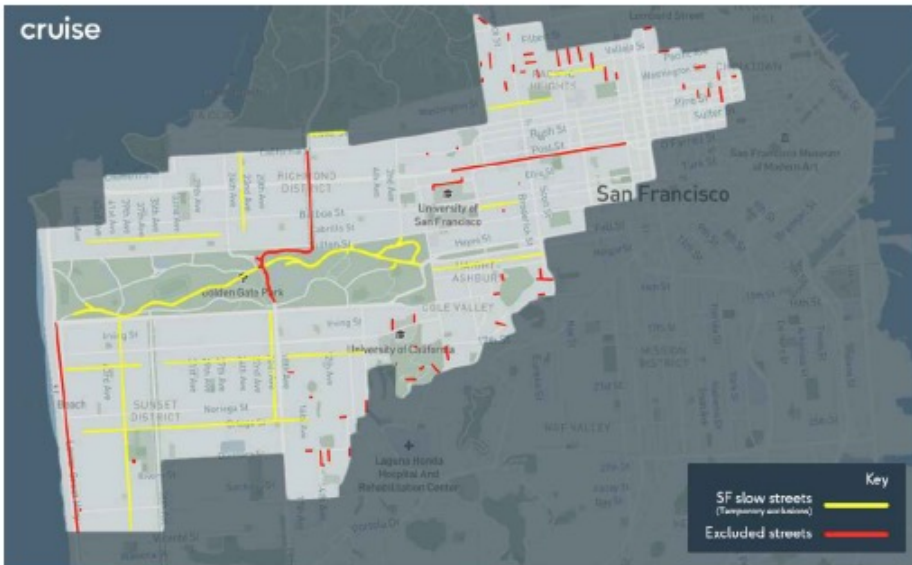


Search example: How can I reduce my bill?

[Home](#) > [Regulatory Services](#) > [Licensing](#) > [Transportation Licensing and Analysis Branch](#) > [Autonomous Vehicle Programs](#)

Autonomous Vehicle Passenger Service Programs

The Commission authorized Drivered and Driverless Pilot and Deployment AV passenger service programs to provide pre-arranged transportation in autonomous vehicles with or without a safety driver.



November 5, 2021

Advice Letter - 0001
(Cruise LLC PSG 00390807)

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA
Consumer Protection and Enforcement Division
500 Van Ness Avenue
San Francisco, CA 94102-3214
douglas.ito@cpuc.ca.gov
AVPrograms@cpuc.ca.gov

**SUBJECT: Cruise Application for Driverless Deployment Permit - Tier 3
Advice Letter**

Setting the Stage

Under the Driverless Test Permit, USF and Cruise launched the Research Rider Pilot in Cruise's initial ODD below, offering a free service for USF students to assess the impact of AVs on rider travel behavior.

"The Dog" ODD



ODD Parameters	
Geography	The ODD included the geofenced area at left within the City and County of SF.
Roadway Type	The ODD included local and arterial roads and excluded steep hills, bridges, tunnels, overpasses, underpasses, and roundabouts.
Speed Range	Cruise vehicles operated at a maximum speed of 30 MPH.
Weather Conditions	The ODD excluded heavy fog, heavy rain, heavy smoke, hail, sleet, and snow.
Time of Day	The ODD was 10:30 PM - 5 AM, and later expanded slightly.

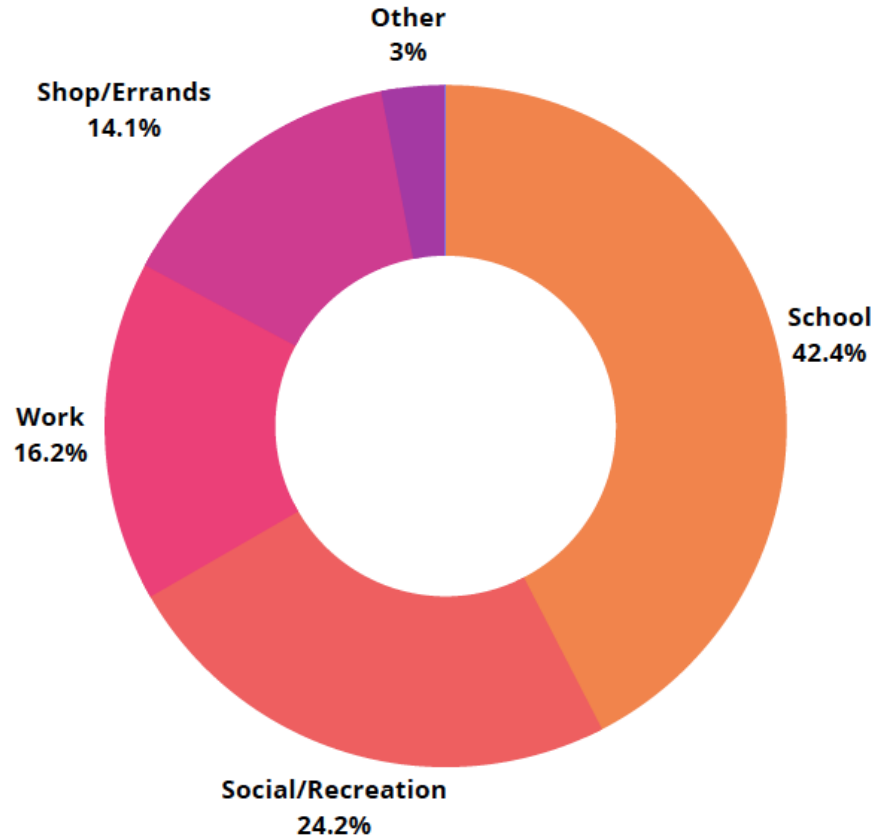
Research Riders

In March 2022 **University of San Francisco + Cruise** implemented the Research Rider Pilot to better understand how autonomous vehicle (AV) service could fill transportation gaps for student riders during late night hours when transit is less frequent.

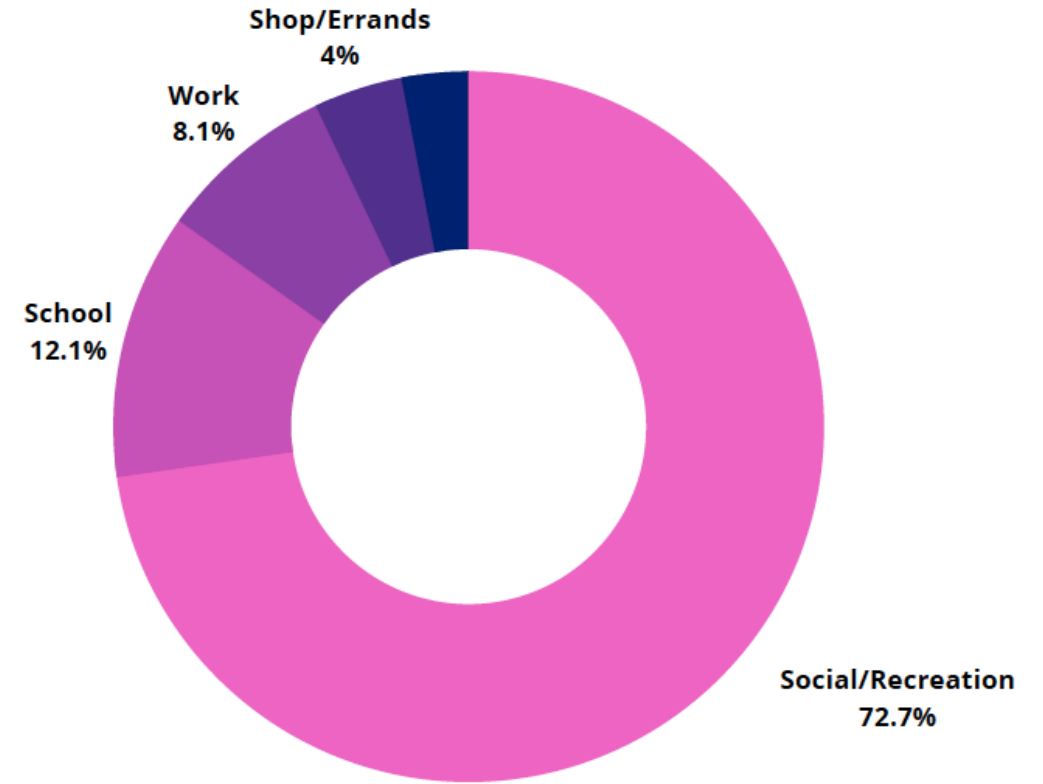
45% female

69% non-white

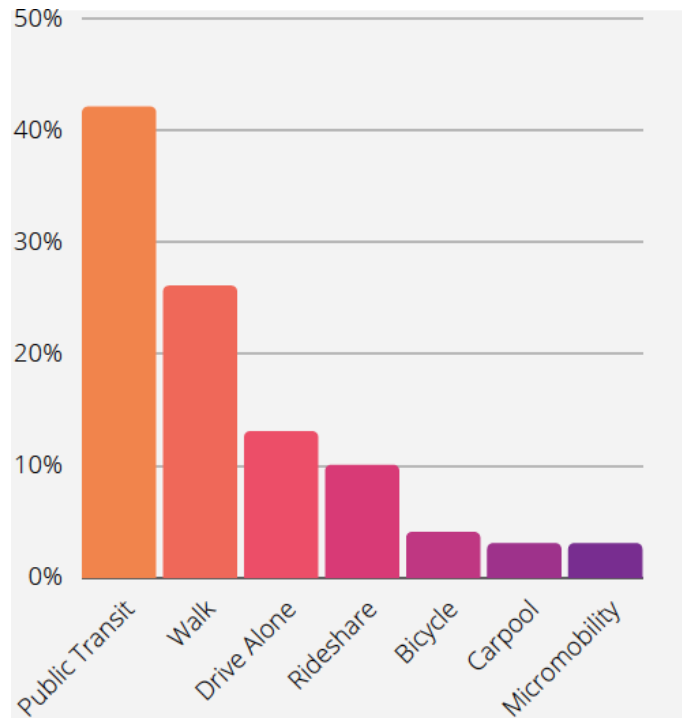
38% on campus



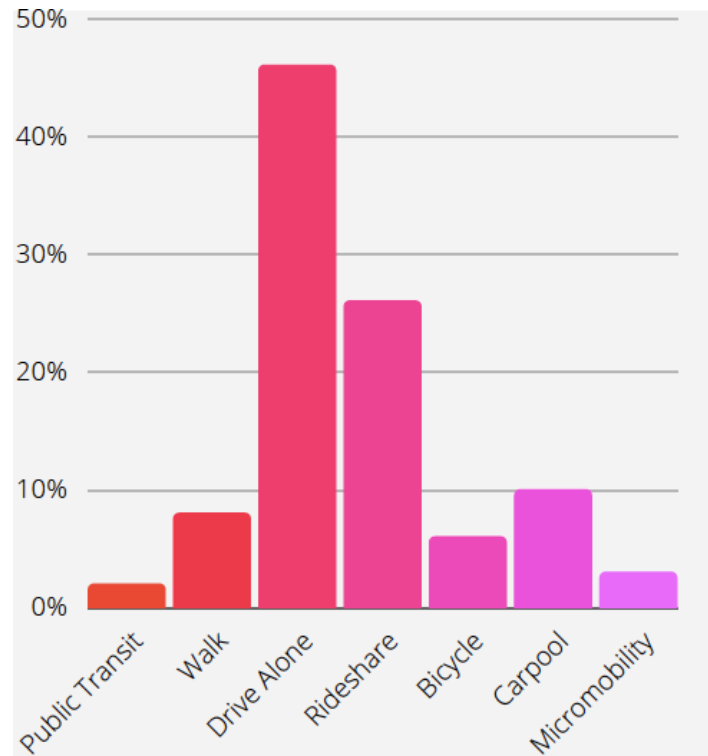
**PRIMARY PURPOSE OF TRIPS WAS
FOR SCHOOL & RECREATION WITH
MIDDAY PEAK IN TRIP VOLUME**



**AFTER 10PM THE PRIMARY
PURPOSE OF TRIPS WAS SOCIAL
OR RECREATION**



THE PRIMARY MODE OF TRAVEL FOR MOST PARTICIPANTS RECRUITED WAS PUBLIC TRANSIT



AFTER 10PM TRANSPORTATION PATTERNS SHIFTED TO DRIVING AND RIDESHARE

91%

Felt that transit connectivity was somewhat or very important in AV service

87%

Felt that good service distribution across the city was somewhat or very important in AV service

66%

Felt that service for those with Disabilities was somewhat or very important in AV service

Complement to Public Transport

Rider pilot experiment data shows that over 55% of these trips may replace rideshare travel and that many are for errands, work or school; filling gaps in the public transport network (e.g. the last mile). **24% represent new travel.**

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The Trip Characteristics of a Pilot
Autonomous Ve...

papers.ssrn.com

Riggs, William and Schrage, Niel and Shukla, Shivani and Mark, Shannon, The Trip Characteristics of Pilot Autonomous Vehicle Rider Program: Revealing Late Night Service Needs & and Desired Increases in Service Quality, Reliability & Safety (August 1, 2022).

<http://dx.doi.org/10.2139/ssrn.4195380>



News

Los Angeles Neighborhood

This Lyft Partnership Program May Change City Transportation

July 9, 2018 | Joseph Pimentel, Bisnow Los Angeles

Want to get a jump-start on upcoming deals? Meet the major Los Angeles players at **one of our upcoming events!**

Maricela Hernandez has only been driving for **Lyft** for about a month but has already observed some key differences with ridership in certain markets.

Downtown Los Angeles has more competition. There are plenty of riders but longer drives and more traffic, she said. In **Pasadena**, there are more tourists. Most of the rides are shuttling people to and from their hotels.

News

Lyft in Monrovia is Almost Too Successful

By Susan Motander - August 9, 2018



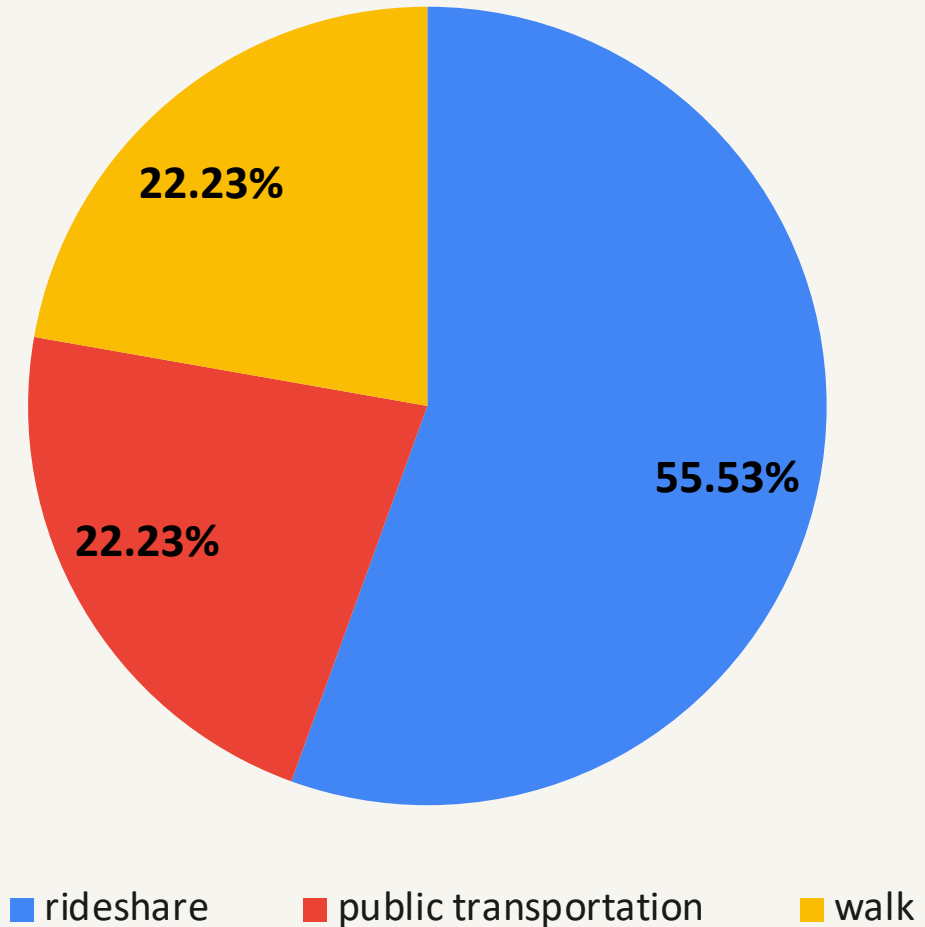
<p>\$5.00 CLASSIC RIDE</p> <p>Travel anywhere within the service area!</p> <p>Private ride or for groups up to 4 passengers</p> <p>No stops before reaching final destination</p>	<p>\$3.00 SHARED RIDE</p> <p>Select a shared ride and receive an even greater discount when traveling in the service area!</p> <p>Up to two (2) passengers</p> <p>Possible stops before reaching final destination</p>	<p>\$1.00 SHARED RIDE</p> <p>Those traveling to and from Old Town Monrovia, the Metro Gold Line Station, or any hospitals within the service area will pay just \$1.00!</p>
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Alternative Travel for AV Riders

56% of riders would have used rideshare. Others would have walked or taken transit.

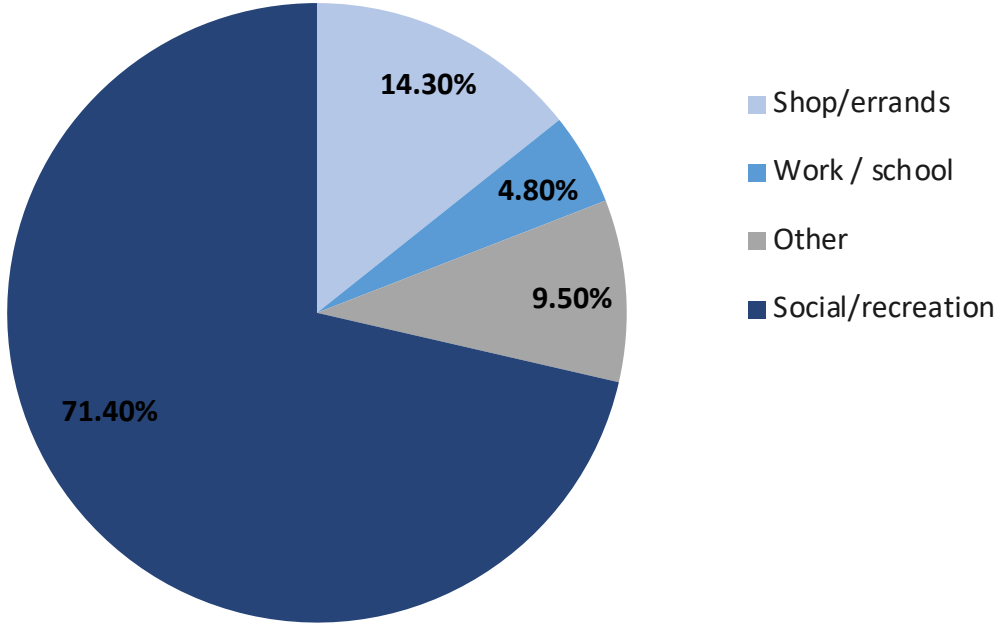
76% of riders would have made the trip via other means even if an AV were not available; existing trips not induced.

Alternative Travel Mode
(If AV was not available)



Travel in an Autonomous Vehicle

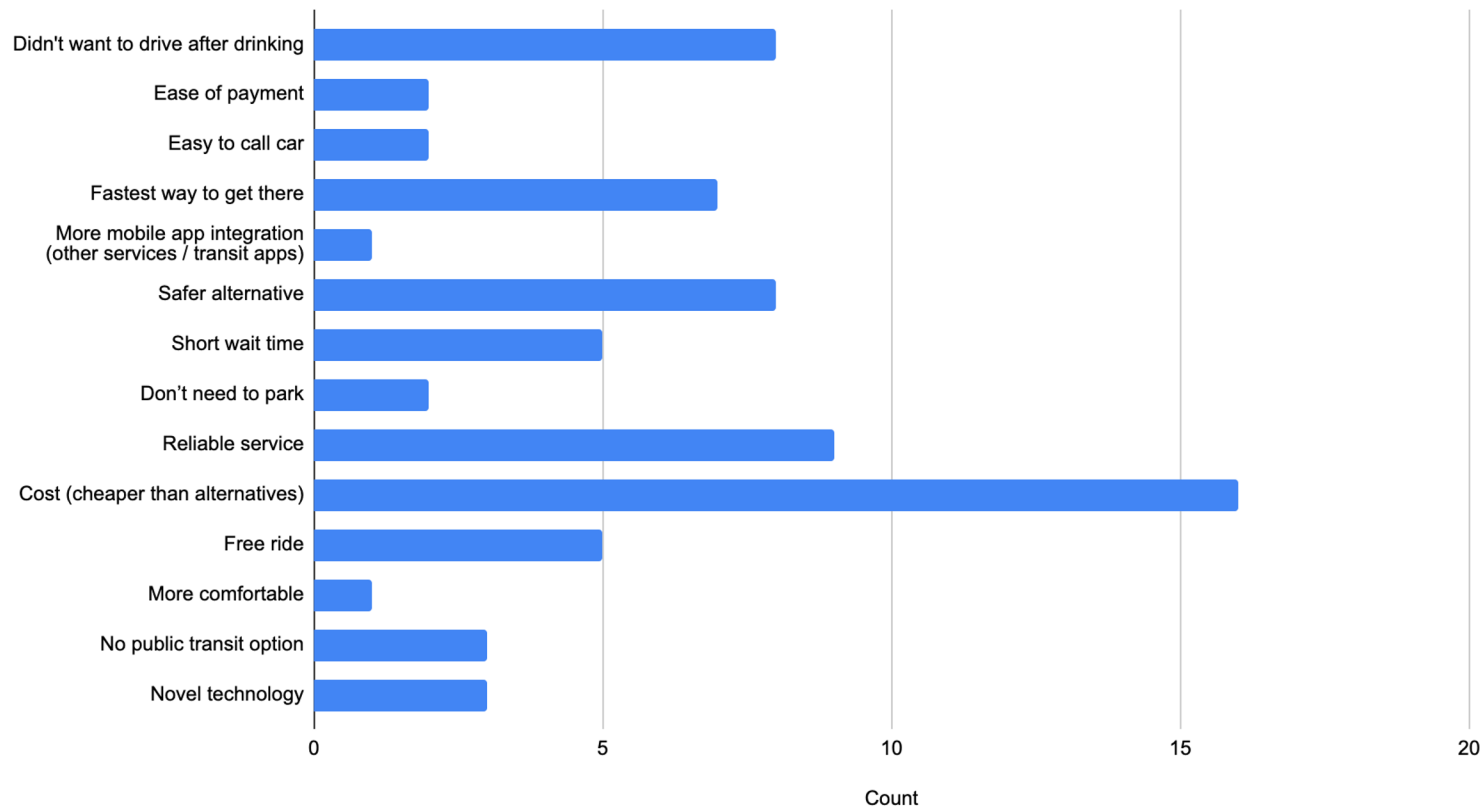
Purpose of Late Night Trips



Data indicate that close to 20% percent of trips were made for shopping, errands, work, or school. This was substantially higher than anticipated. 71% of riders used the vehicles for social or recreational purposes. Many “Other” trips were linked in nature with multiple purposes.

Factors Influencing Ride in an AV

Top Factors to Encourage AV Usage



“Sometimes getting out to where I live there's not a whole lot of real good direct bus service.... And then certainly, the fact that the Cruise vehicles are available is pretty darn awesome...”

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Early results show that they serve as a compliment and supplement for transit and fill needs for latent travel demands. **Other factors include safety, green ride / sustainability, comfort, reliability and convenience.**

Many women expressed that the capability of riding in an autonomous rideshare vehicle was a vast improvement in safety over traditional rideshare (e.g. Uber/Lyft).

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Worry of issues of driver aggression or assaults; descriptions of uncomfortable drop off situations.

Lessons / Opportunities for PTOs, OEMs, & Cities

- **Policy & Testing Agility**
 - Scaffolded policy, testing & safety approval process to allow for quicker / more agile deployments with tiered approvals
 - Incentivize venture investment and startup experimentation
- **Creative ODD – More Than SAE Levels**
 - Development, evolution & experimentation
 - Define exiting ODD or incident response (human transition)
 - Share construction & emergency data
- **Opportunity to Innovate / Increase Efficiency**
 - Create consumer facing products for public transport applications
 - Potential improvements to traffic operations and eliminate wasted VMT

Lessons / Opportunities for PTOs, OEMs, & Cities

- **Rider Data Consideration / Still Potential for Sharing**
 - Off-peak trips may not increase total travel / VMT; capture latent travel
- **Infrastructure Opportunities**
 - Signs, lines and potholes; lane / roadway prioritization (create network / operational efficiency)
 - Pick and drop off / curb availability / potential use of transit stops
 - Leveraged digital / 3D mapping; challenge for some deployments
- **Business Model Partnerships**
 - Refinement and partnership likely needed for sustainable business model alongside an emphasis on last mile / shared mobility services

Resolvable Issues Related to Emergency Responders

An Autonomous Car Blocked a Fire Truck Responding to an Emergency

The incident in San Francisco cost first responders valuable time, and underscores the challenges Cruise and other companies face in launching driverless taxis.



'No! You stay!' Cops, firefighters bewildered as driverless cars behave badly

Firefighters smash windows to make autonomous vehicles stop, incident reports show. See interactive map at end of article.

by JOE ESKENAZI
MAY 1, 2023



VEHICLE ENCOUNTERS & EVADES BUT TAKES 24 SECONDS

4. As these autonomous vehicles are learning traffic patterns they have become more aggressive with first responder units and their attempts to navigate around them. They could potentially delay fast, aggressive hose leads as well as impede ladder and tool removal from trucks.
5. This was our second such interaction today. First was UO submitted by Battalion 4 Incident # 23056929

FIRST RESPONDER IGNORES PROTOCOL & SMASHES WINDOW

From: [REDACTED] IT 2 - DE
To: Chief - Battalion 05
Reference: Rules and Regulations, Section 1128

1. At fire at 1310 Hayes last night an electric car with no driver kept driving towards fire scene and was going to run over our hoses and possibly put our firefighters at risk.
2. I yelled at car twice to stop, banging with my fist on hood.
3. After warning car twice I smashed the window and the vehicle stopped .
thank you

Workflow From To

Incident Response & Communication

- Incident response (police / fire / ambulance) require that first first responders are trained and abide by that training.
- Need for anticipatory data to update on-board maps: Construction, Emergency Management, Etc.
- Charging infrastructure important



We'll be back after some routine maintenance

Something happened on your trip

Blueberry is pulling over to a safe stop

- 📞 Cruise Support is calling you to help
- 🚗 Stay buckled up and wait in the car
- 👁️ If you need to, exit on the sidewalk side (check for bikes and cars)



Operational Corner Cases

future tense

Self-Driving Taxis Are Causing All Kinds of Trouble in San Francisco

They've blocked traffic, driven on the sidewalk, sped away from cops —and the city is powerless to stop them.

BY DAVID ZIPPER

DEC 08, 2022 • 11:45 AM



MANY OPERATIONAL CHALLENGES CAN RELATE TO DEFINITIONS IN ODD (STREET GRID, WEATHER, ETC.) AND CURB / PARKING POLICIES

LEGALITY OF COMMERCIAL VEHICLES TO BLOCK TRAFFIC FOR SAFE DROP OFF (CURB CUT IS ILLEGAL!)

*“...journeys were mostly smooth, though one car summoned stopped **alongside a construction site**, forcing to walk through traffic to get into the car.*”

ROUTING CHALLENGES BASED ON ODD

*“...driverless taxi went... **blocks farther than necessary**, roughly half a mile, apparently to avoid the most crowded roads....”*

BUSINESS

San Francisco Officials Make Last-Ditch Effort To Block Robotaxi Deployment

Written by Kevin Truong
Published Jun. 02, 2023 • 5:00am



Waymo is poised to get approval to run its robotaxi services 24 hours a day across San Francisco on June 29. | Justin Sullivan/Getty Images





COIN
WASH-DRY

7UP
VETERAN'S
LIQUOR

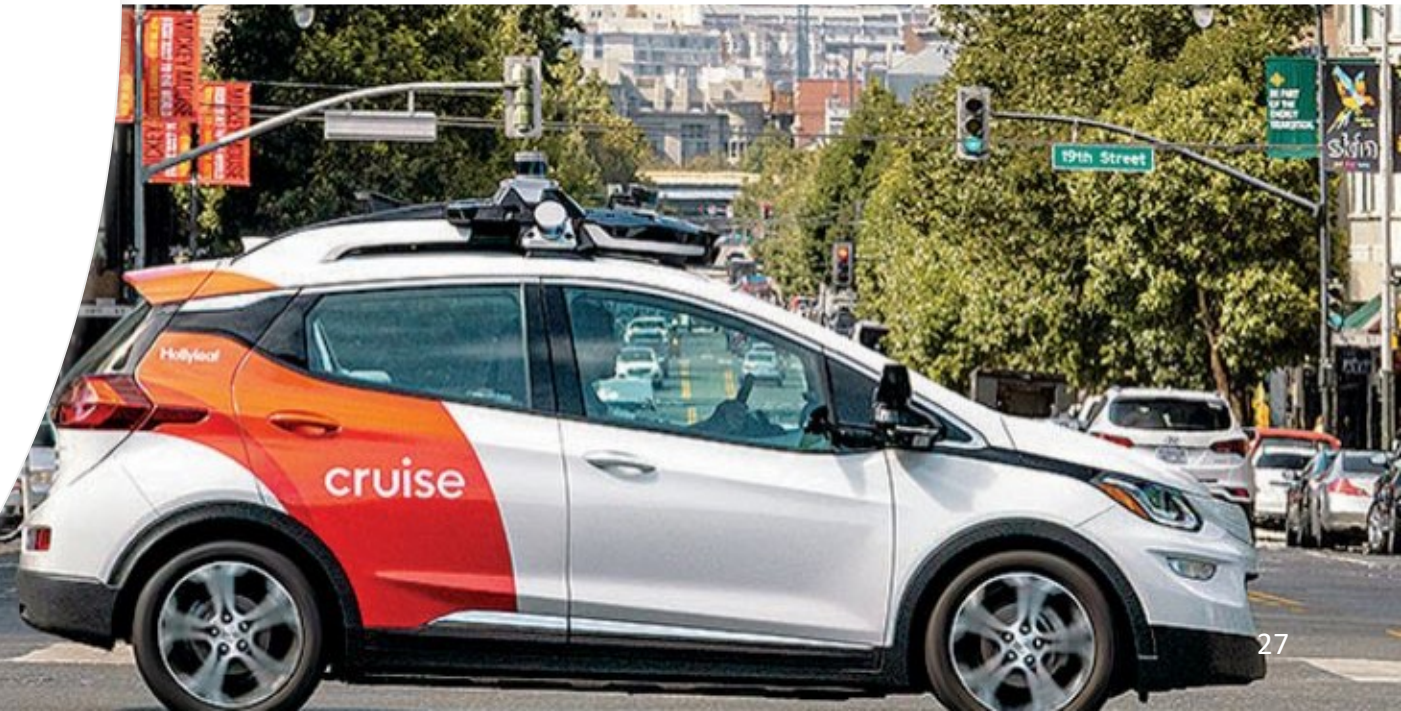
Balboa Park
Station

1447A
DO NOT PASS

7UP
VETERAN'S
LIQUOR

Evaluating Street Grid Networks for Surplus Travel

- Simulate total daily vehicle trips for each model ($n = 1,133,333$) using Dijkstra's shortest-path algorithm
- Two OD matrices of San Francisco street network (no freeways) using OpenStreetMap and OSMnx:
 - "survey-derived" between homes and workplaces (CHTS); random "survey-derived to cover more of the city"
 - Real World Directionality (G1) real real-world "status-quo" one-way directionality
 - Bidirectional Two-Way Network (G2)
- Tests for weighting of trip length
- Shortest path between the origin and destinations and free-flow travel w/out queuing model.



Outcomes: Shorter trips, fewer blocks traversed, less VKT

	Survey-derived trips		Randomized trips	
	G_1	G_2	G_1	G_2
Median trip length (m)	4,684	4,606	6,330	6,235
Mean trip length (m)	4,943	4,871	6,448	6,364
Median blocks traversed	38	36	49	46
Mean blocks traversed	39.0	37.2	49.8	47.3
Surplus annual VKT	24,247,315	—	21,878,100	—
Surplus annual fuel consumed (liters)	2,309,035	—	2,083,418	—
Surplus annual CO2 released (kg)	5,533,650	—	4,992,955	—

Boeing, G. and **Riggs, W.** (2022). Converting One-Way Streets to Two-Way Streets to Improve Transportation Network Efficiency and Reduce Vehicle Distance Traveled. *Journal of Planning Education and Research*.

<https://doi.org/10.1177/0739456X221106334>



Routledge Equity, Justice and the Sustainable City series

DISRUPTIVE TRANSPORT

**DRIVERLESS CARS, TRANSPORT INNOVATION AND
THE SUSTAINABLE CITY OF TOMORROW**

Edited by
William Riggs



END OF THE ROAD

**REIMAGINING THE STREET AS
THE HEART OF THE CITY**



WILLIAM RIGGS



Disruptive Transport: Driverless Cars,
Transport Innovation and the Sustainable
City of Tomorrow
Available from Routledge:
<http://bit.ly/disruptivetransport>



End of the Road: Reimagining the
Street as the Heart of the City.
Available for preorder now:
<https://bristoluniversitypress.co.uk/end-of-the-road>

2023



USF + Cruise AV City Initiative Research Rider Pilot Project

<http://dx.doi.org/10.2139/ssrn.4195380>

William Riggs, PhD, AICP, LEED AP
wriggs@usfca.edu | @billyriggs

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----- Forwarded message -----

From: Hayden Anderson <hayden@gfpublicaffairs.com>

Date: Monday, October 23, 2023 at 5:00:49 PM UTC-7

Subject: Letter of support for Autonomous Vehicle Industry

To: clerk@sfcta.org <clerk@sfcta.org>

Please see attached a letter of support for the Autonomous Vehicle industry on behalf of sf.citi.

Thank you.

--

Hayden Anderson, Account Executive

[Ground Floor Public Affairs](#) | [LinkedIn](#)

58 2nd St. 4th Floor | San Francisco, CA 94105

c: (480) 848-2946

October 23rd 2023

San Francisco Transportation Authority Board
1455 Market Street, 22nd Floor
San Francisco, CA 94103

RE: Support for Driverless Autonomous Vehicles in San Francisco

Dear Transportation Authority Board Members,

sf.citi is writing to express our unwavering support for the autonomous vehicle industry and its potential to bring about a multitude of benefits for riders while contributing to the advancement of citywide goals and safety.

sf.citi represents dozens of the world's foremost tech companies that employ tens of thousands of people in San Francisco. Our mission is to empower our community to have a voice on issues and policies critical to advancing our industries. We recognize the transformative potential of autonomous transportation in reshaping mobility and providing safer and more accessible transit options for all Californians. The autonomous vehicles industry's steadfast commitment to passenger safety, exemplified through its comprehensive passenger safety plan, can furnish reliable and secure transportation methods.

As a vital contributor to San Francisco's transportation landscape, the autonomous vehicle industry holds the potential to mitigate human errors that often lead to accidents and traffic fatalities. By eliminating the risks associated with drunk, distracted, or texting drivers, self-driving vehicles are poised to significantly enhance road safety for all users.

Moreover, autonomous vehicles have the capacity to position San Francisco as a global leader in the realm of sustainable transit solutions. The adoption of electric cars and collaborative efforts to bolster electric vehicle charging infrastructure will play a pivotal role in assisting San Francisco in meeting state climate goals and fortifying our energy grid.

Crucially, autonomous vehicles offer pragmatic solutions to the pressing transportation challenges that California currently faces. These solutions encompass improved safety, environmental quality, and expanded transportation options that cater to diverse populations, including seniors, individuals with physical disabilities, and the visually impaired. By providing an affordable and convenient alternative for navigating the state, autonomous transportation brings us closer to creating an equitable and inclusive transportation service.

We kindly request your consideration of our support for the autonomous vehicle industry and the remarkable opportunities it offers our City.

Thank you.

sf.citi



October 23, 2023

RE: 10/24/ SFCTA Board Meeting - Agenda Item 11 - Autonomous Vehicle Update

Dear SFCTA Board:

Waymo is an autonomous driving technology company. **We are proud to offer our safe, accessible, all-electric and fully autonomous ride-hailing service to San Francisco residents.** San Franciscans can take a ride in a Waymo vehicle equipped with our transformative automated driving system, the Waymo Driver™, from all corners of the city at any time of day. Below is a high level summary of Waymo's safety performance, first responder engagement and product features, as well as information about Waymo's efforts to provide an inclusive ride-hailing service.

Safety is at the core of Waymo's mission

In 2009, Waymo set out on a mission to develop the world's safest and most experienced driver. Over the last decade and a half, we've autonomously driven tens of millions of miles on public roads and tens of billions of miles in simulation. The data to date indicates that the Waymo Driver is already [reducing traffic injuries and fatalities](#) in the places where we operate.

Waymo's safety performance is complemented by our pioneering commitment to safety transparency, which has included publishing over twenty safety technical papers (available at waymo.com/safety). These publications include a [recent study](#) led by [Swiss Re](#), one of the world's leading reinsurers, that clearly demonstrated the safety of the Waymo Driver as compared to human drivers. The study, which used liability insurance claims data, found that Waymo's autonomous vehicles significantly reduced the frequency of property damage claims and completely eliminated bodily injury claims - a drastic contrast to the human driver insurance claim baseline.

Waymo's San Francisco operations are conducted under the ongoing and active oversight of the Department of Motor Vehicles (DMV), California Public Utilities Commission (CPUC), and the National Highway Traffic Safety Administration (NHTSA). Waymo is subject to the comprehensive requirements and operating conditions of these robust existing state and federal AV safety regulatory frameworks in deploying our transformative service to the public.

First responder training and emergency vehicle interaction product features

Waymo is committed to being a responsive partner to first responders and city staff to build trust and ensure safety. For over three years, we have met regularly with San Francisco first



responders and city transportation staff to share insights into our operations, especially with respect to our approach to safety. We have conducted in-person training for and sought feedback from more than 1,000 San Francisco first responders, with more trainings to come.

Waymo senior safety and engineering leadership also meet regularly with the SFFD and SFPD leadership, as well as the Department of Emergency Management, California Highway Patrol, and other San Francisco public safety agencies, to address their concerns and gain a deeper understanding of their needs. In these meetings, Waymo has shared how our vehicles successfully navigate hundreds of interactions with emergency vehicles and emergency scenes on a daily basis. We do this using our comprehensive sensor suite (lidar, audio detectors and radar) to detect and localize (i.e., determine how far away, from what direction, etc.) emergency vehicles and their flashing lights and sirens. We've also explained how our prediction models are trained with emergency vehicle signals to help bolster this ability.

As part of our ongoing dialogue, Waymo appreciates being able to review the specific situations and interactions involving Waymo vehicles that SFFD has communicated to us, including the 14 SFFD Unusual Occurrence reports from March - July 2023. Doing so has facilitated a productive and constructive two-way flow of information, enabling SFFD leadership to gain a clearer and more accurate understanding of the events and providing Waymo with valuable feedback that has been incorporated into improvements to the Waymo Driver when needed.

For example, Waymo has:

- Enhanced the ability of the Waymo Driver to reverse in narrow roads to make space for oncoming emergency vehicles
- Streamlined communications with first responders during interactions
- Developed external audio messages that play from the roof dome to help first responders better understand the Waymo Driver's intentions, such as plans to turn around or reverse
- Reduced the time and effort required for first responders to speak with Waymo operators assisting the vehicle
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We also know that electric car ownership is out of many people's price range, and charging infrastructure isn't as widely available or reliable as it needs to be for individual drivers. Waymo makes it easier for the many people that can't afford their own electric vehicles to travel emissions free using our all electric fleet. In doing so, San Francisco gains another zero-emission transportation option to help them meet their climate goals - one that, by improving road safety, can also encourage more people to walk or bike where they need to go with confidence.

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Thank you for the opportunity to provide these comments. We look forward to continued dialogue and conversation.

Sincerely,

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Michelle Peacock
Head of Global Policy, Waymo

Monday, Oct 23, 2023

Cruise Comments submitted for the record

SFCTA Commissioners

SFCTA Board Meeting

Tuesday, Oct 24, 2023 10AM

Legislative Chamber, Room 250

City Hall

Dear SFCTA Chair Mandelman, Vice-Chair Melgar, and Commissioners:

Thank you for the opportunity to submit written comments for the record in advance of your October 24th board meeting.

At Cruise, we share SFCTA's goals of safe, accessible, and equitable transportation options for San Francisco residents and visitors. Safety is our top priority and central to our mission: we are proud of our safety record after more than 5 million driverless miles. We are also focused on continuous improvement and, to that end, Cruise regularly releases both major and minor software updates. Recently, Cruise has incorporated significant technological improvements to AV capabilities and implemented new processes and procedures directly in response to feedback from emergency responders and city departments.

We work closely with emergency responders in San Francisco, particularly in the last few months, to understand their specific concerns and to address their feedback. We meet regularly with leaders at the San Francisco Municipal Transportation Authority, the San Francisco Fire Department, the San Francisco Police Department and the San Francisco Department of Emergency Management. We also coordinate with our AV industry partners to standardize processes, where possible, and participate in joint meetings with the city to facilitate communication and collaboration.

As a direct result of the ongoing partnership with CCSF departments, Cruise has taken on a number of workstreams to enhance capabilities and improve our interactions with first responders out on the road. Below, we've outlined highlights of the improvements we've rolled out in the last few months.

Software Updates

Preemptive AV slowing during siren detection: AVs now proactively slow down at an early indication of a nearby siren when emergency vehicles are not yet visible.

Improved emergency vehicle prediction behavior: Enhanced AV ability to predict if a fire truck will continue to drive through an intersection against a red light, while factoring in the speed at which that will happen.

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Dispatch

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Motorcade Practice with SFPD

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Training

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Conclusion

Thank you, again, for the opportunity to detail some of the changes we've instituted and the ongoing coordination we enjoy with various teams and departments in city government. Cruise endeavors to be a partner with you and we look forward to our continued collaboration with SFCTA to make the streets safer and more accessible for all road users in the City and County of San Francisco.



October 23, 2023

RE: 10/24/ SFCTA Board Meeting - Agenda Item 11 - Autonomous Vehicle Update

Dear SFCTA Board:

Waymo is an autonomous driving technology company. **We are proud to offer our safe, accessible, all-electric and fully autonomous ride-hailing service to San Francisco residents.** San Franciscans can take a ride in a Waymo vehicle equipped with our transformative automated driving system, the Waymo Driver™, from all corners of the city at any time of day. Below is a high level summary of Waymo's safety performance, first responder engagement and product features, as well as information about Waymo's efforts to provide an inclusive ride-hailing service.

Safety is at the core of Waymo's mission

In 2009, Waymo set out on a mission to develop the world's safest and most experienced driver. Over the last decade and a half, we've autonomously driven tens of millions of miles on public roads and tens of billions of miles in simulation. The data to date indicates that the Waymo Driver is already [reducing traffic injuries and fatalities](#) in the places where we operate.

Waymo's safety performance is complemented by our pioneering commitment to safety transparency, which has included publishing over twenty safety technical papers (available at waymo.com/safety). These publications include a [recent study](#) led by [Swiss Re](#), one of the world's leading reinsurers, that clearly demonstrated the safety of the Waymo Driver as compared to human drivers. The study, which used liability insurance claims data, found that Waymo's autonomous vehicles significantly reduced the frequency of property damage claims and completely eliminated bodily injury claims - a drastic contrast to the human driver insurance claim baseline.

Waymo's San Francisco operations are conducted under the ongoing and active oversight of the Department of Motor Vehicles (DMV), California Public Utilities Commission (CPUC), and the National Highway Traffic Safety Administration (NHTSA). Waymo is subject to the comprehensive requirements and operating conditions of these robust existing state and federal AV safety regulatory frameworks in deploying our transformative service to the public.

First responder training and emergency vehicle interaction product features

Waymo is committed to being a responsive partner to first responders and city staff to build trust and ensure safety. For over three years, we have met regularly with San Francisco first



responders and city transportation staff to share insights into our operations, especially with respect to our approach to safety. We have conducted in-person training for and sought feedback from more than 1,000 San Francisco first responders, with more trainings to come.

Waymo senior safety and engineering leadership also meet regularly with the SFFD and SFPD leadership, as well as the Department of Emergency Management, California Highway Patrol, and other San Francisco public safety agencies, to address their concerns and gain a deeper understanding of their needs. In these meetings, Waymo has shared how our vehicles successfully navigate hundreds of interactions with emergency vehicles and emergency scenes on a daily basis. We do this using our comprehensive sensor suite (lidar, audio detectors and radar) to detect and localize (i.e., determine how far away, from what direction, etc.) emergency vehicles and their flashing lights and sirens. We've also explained how our prediction models are trained with emergency vehicle signals to help bolster this ability.

As part of our ongoing dialogue, Waymo appreciates being able to review the specific situations and interactions involving Waymo vehicles that SFFD has communicated to us, including the 14 SFFD Unusual Occurrence reports from March - July 2023. Doing so has facilitated a productive and constructive two-way flow of information, enabling SFFD leadership to gain a clearer and more accurate understanding of the events and providing Waymo with valuable feedback that has been incorporated into improvements to the Waymo Driver when needed.

For example, Waymo has:

- Enhanced the ability of the Waymo Driver to reverse in narrow roads to make space for oncoming emergency vehicles
- Streamlined communications with first responders during interactions
- Developed external audio messages that play from the roof dome to help first responders better understand the Waymo Driver's intentions, such as plans to turn around or reverse
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