

Driverless Transport: Can Driver-Out Service Become Repeatable, Safe and Economic?

INITIATION MODE	CATALYST	EXPECTED SIGNIFICANCE
Post-event ecosystem baseline Driver-out public rides began in Phoenix in 2020, Kodiak's industrial driverless trucks in 2024 and Aurora's public-road Class 8 service in 2025.	Useful, safe and economically viable driver-out service Tested domain by domain in a passenger branch and a freight branch; companies supply evidence.	★★★★☆ Breadth against U.S. commercial road transport; basis on page 18. Depth and outcome stay ungraded.

My take

Driverless transport means vehicles that carry riders or freight with nobody in the driver's seat, inside a validated operating domain: named cities or lanes, road types, speeds, hours and weather. By October 2026 that service runs in a few places. Waymo reports 271.3 million rider-only miles through June 2026, and California's regulator recorded 4,220,075 completed Waymo trips in the second quarter. In freight, 35 Kodiak-equipped Atlas trucks hauled sand driverless in the Permian Basin at June 30, and Aurora reported nearly 440,000 driverless miles.

The outcome I test is the catalyst itself: whether driver-out service becomes commercially useful, safe and economically viable inside separately defined service domains. Companies enter only as carriers of that evidence through named products, such as the Waymo Driver, Zoox's robotaxi, Apollo Go, the Aurora Driver and the Kodiak Driver, so no single company's results pass or fail it. The record shows useful, repeatable driver-out service in U.S. surface-street ride-hail and Permian sand hauling, and IIHS's 2021–24 analysis supports a large injury-crash reduction for Waymo in the first. However, none of the disclosures I reviewed isolates driver-out profit and loss, so economic viability is unresolved in every domain.

Decision question

In which named service domains, if any, has driver-out transport become commercially useful, safe and economically viable, judged separately for each passenger and freight domain and whichever company supplies the evidence?

Post-event initiation

The shift is already under way, so I set the baseline from the latest dated records: the CPUC second-quarter 2026 Waymo filing, Waymo's safety hub through June 2026, the July 2026 IIHS study, second-quarter company results and disclosures through October 22, 2026. Forward tests begin with third-quarter filings.

Catalyst-scope firewall

Fleet targets, financing, city announcements, partner logos and any company's overall growth or losses are context. I credit none of them to the catalyst without a dated driver-out operating record in a named domain. Alphabet, Tesla, Uber, Volvo, Magna and NVIDIA consolidated results are context only, because none of them isolates driverless operations.

CATALYST DEFINITION AND SCOPE

One Catalyst, Two Branches, Six Service Domains

Catalyst field	Definition
Event	Commercial driver-out service: no human driver or in-vehicle safety monitor at the controls, carrying the public or paying freight inside a named operating domain (ODD).
Occurrence	Established in limited domains. Passenger: Waymo rider-only service in five U.S. metro areas, with Tesla, Zoox and three Chinese operators reporting driver-out rides. Freight: Kodiak and Aurora sand hauling in the Permian Basin and Aurora on Texas highway lanes.
Mechanism	Validated domain ▶ driver-out operation ▶ remote assistance and field support ▶ utilization (trips or loaded miles per vehicle) ▶ revenue ▶ cost per mile after vehicles, hardware, remote labor, depots and insurance ▶ domain contribution.
Outcome tests	Each service domain is read on three gates: commercially useful and repeatable, safe, and economically viable. A branch reading summarizes its domains without adding their miles, crashes or revenue, and the two branches are never combined.
Observation mode	Ongoing from the October 22, 2026 baseline; no fixed terminal.

The two branches and their service domains

Branch	Service domain	Evidence carriers (company: product)	Status, Oct. 22, 2026
Passenger	U.S. urban and suburban surface streets, ride-hail	Waymo: Waymo Driver; Tesla: Robotaxi service; Zoox: purpose-built robotaxi	Driver-out, public
Passenger	Freeways and airports	Waymo: Waymo Driver (limited freeway miles; LAS airport from Oct. 21)	Partial; outside Waymo's published benchmark
Passenger	China urban ride-hail	Baidu: Apollo Go; Pony.ai: robotaxi services; WeRide: Robotaxi	Driver-out; kept in separate rows
Passenger	Not yet in a domain test	Motional, Avride, Nuro Driver on Lucid Gravity, all via Uber; watch rows on page 17	Operator onboard
Freight	Permian sand: repeat short routes	Kodiak: Kodiak Driver on Atlas trucks; Aurora: Aurora Driver for Detmar	Driver-out, customer service
Freight	Repeat middle-mile and regional	Gatik: middle-mile service; Pony.ai: Gen-4 Robotruck at Mawan port	Company claims; kept in separate rows
Freight	Open-highway Class 8	Aurora: Aurora Driver on International LT trucks; Kodiak, Volvo VAS, Waabi pending	Aurora driver-out; others targeted

Shared layer

Remote assistance labor, hardware cost and service life, and permits and enforcement apply to both branches. A shared evidence register records them once, but I assess each item per operator, platform and domain, and nothing transfers automatically from one to another. Remote advice stays separate from remote control.

MEASUREMENT CONTRACT

One Row per Operator, Platform, Domain and Quarter

Every observation is recorded as one row per operator, platform generation, operating domain and quarter. The fields below stay separate in each row, and a number that is not disclosed is left blank.

Field group	Kept separate	Why it matters
Domain	Geography, road type, speed, weather, curb, airport, accessibility	Safety and cost claims hold only inside the domain that produced them
Seat status	Driver, in-vehicle monitor, empty seat, rear-seat support staff	Driver-out claims depend on who is aboard
Remote role	Remote advice vs remote control	Tesla says its remote operators can drive a vehicle at up to 10 mph; others give guidance only
Miles	Total, autonomous, fully driverless, occupied or loaded, repositioning; CPUC Periods 1, 2 and 3	Safety and economics use different denominators
Output	Completed trips vs passengers; loads and tons; fared classification vs collected fares	A trip count is neither revenue nor a rider count
Fleet	Commissioned, dispatchable and active vehicle-hours	Utilization drives cost per mile
Safety	Crash involvement, first contact and fault; injury and airbag definitions	Operators define numerators differently
Money	Revenue vs gross bookings, promotions, subsidies; cash cost, depreciation, R&D	Only domain contribution can pass the economic gate
Commitments	Deployed purchases, binding contracts, non-binding MOUs, targets	Intent and capacity are separate from output

Matching rule

I use a safety numerator only with a denominator from the same period, place and domain. I never add miles, kilometers, crashes, rides or revenue across operators or domains, and undisclosed cost and intervention figures are left blank and never estimated.

Evidence labels used in this thesis

Label	Meaning
Reported fact	Stated in a regulator filing, an SEC filing or the issuer's own results release, with its definition and period kept
Company statement or target	A management claim, forecast, intent or capacity aspiration; furnished investor materials fall here
Independent analysis	A third party's analysis of operator-reported data; it does not audit the underlying miles
Author calculation	Reproducible arithmetic from disclosed inputs, labeled and period-bound
Unknown	Required evidence absent from the records reviewed; no substitute is inferred

Who Runs Driver-Out Passenger Service

Operator	Domain and seat status	Latest dated figure	Label
Waymo	U.S. surface streets in Phoenix, Bay Area, LA, Austin, Atlanta; 15th U.S. city (Las Vegas) on Sept. 14, 2026; some freeway miles; LAS airport from Oct. 21. Empty driver's seat	271.3M rider-only miles through June 2026; told Congress in Feb. 2026 of more than 400,000 trips a week, which it called paid; fare collection not verified; "more than 500K" trips a week on an undated page; target over 1M rides a week by end-2026	Company; target [3, 15, 18, 17]
Tesla	Austin, Dallas and Houston, plus Orlando, Tampa and Miami in its safety report; remote operators can drive at up to 10 mph	Nearly 2M cumulative unsupervised miles at Sept. 30; Cybercab rides in Austin from Sept. 3; no robotaxi revenue disclosed	Company [9, 8, 14]
Zoox	Las Vegas public service with airport rides; San Francisco free rides by waitlist	Nearly 2M robotaxi miles and 350,000+ riders (Amazon, Apr. 29, 2026); fare collection in Las Vegas not confirmed in primary records reviewed; no matched driverless safety denominator	Company [23, 24]
Baidu Apollo Go	China plus overseas footprint of 28 cities, including testing cities	350M+ autonomous km incl. 240M+ fully driverless km to date (Q2); 3.2M fully driverless rides in Q1	Company, China [33, 34]
Pony AI	Chinese tier-one cities; Luxembourg, Singapore partners	1,975 robotaxis at June 30 vs 3,500+ year-end target; robotaxi revenue \$12.1M in Q2	Reported, China [36]
WeRide	China and overseas	~3,400 L4 vehicles incl. 1,800+ robotaxis at July 31; 21+ daily rides per domestic vehicle	Company, China [37]
Motional; Avride	Las Vegas and Dallas via Uber, with operators onboard	Supervised phase; driverless share not stated	Company [29, 30]
Nuro, Lucid, Uber	Houston testing with safety operators	Launch expected mid-2027	Target [28]
Cruise (GM)	Former San Francisco driver-out service; California permits suspended Oct. 2023	Robotaxi operations wound down	Reported [31, 32]

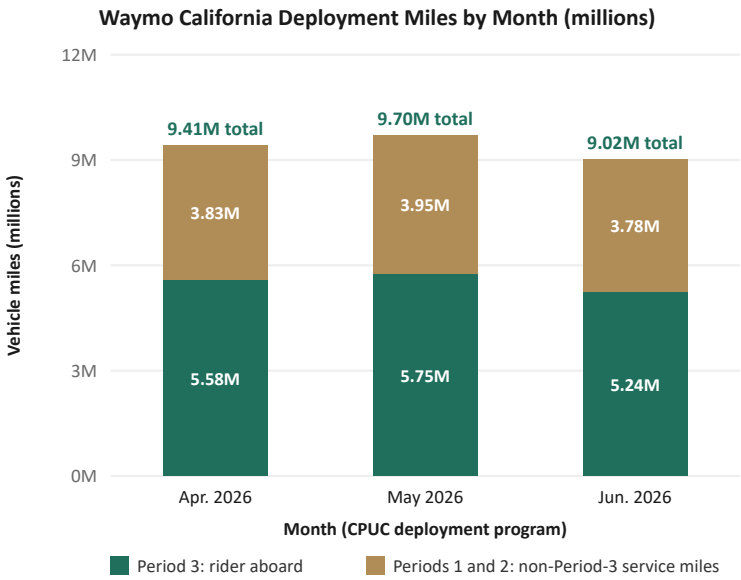
What the passenger record establishes

Waymo has run driver-out public service across five metro areas long enough to publish 271.3 million rider-only miles, and California's regulator records its volume trip by trip. Tesla and Zoox now run driver-out rides on a smaller scale, and Waymo raised a \$5 billion term loan on October 8 after \$16 billion of equity earlier in 2026 [19]. That financing funds expansion, so I read it as capital access rather than operating profit.

What it does not establish

None of the disclosures reviewed gives cost or contribution for a driver-out passenger service. Pony reports robotaxi-services revenue, although that is neither collected fares nor a cost bridge, Waymo's weekly ride figures carry no fare-collection series, Tesla reports no robotaxi profit and loss, and the Chinese operators report fleet and ride counts under their own definitions. City counts and targets say little about geofence size, access rules or utilization.

Three Mileage Periods in One Quarter



Non-Period-3 service mileage was 41.1% of Waymo's California deployment miles in the quarter, by my calculation from the CPUC monthly file.

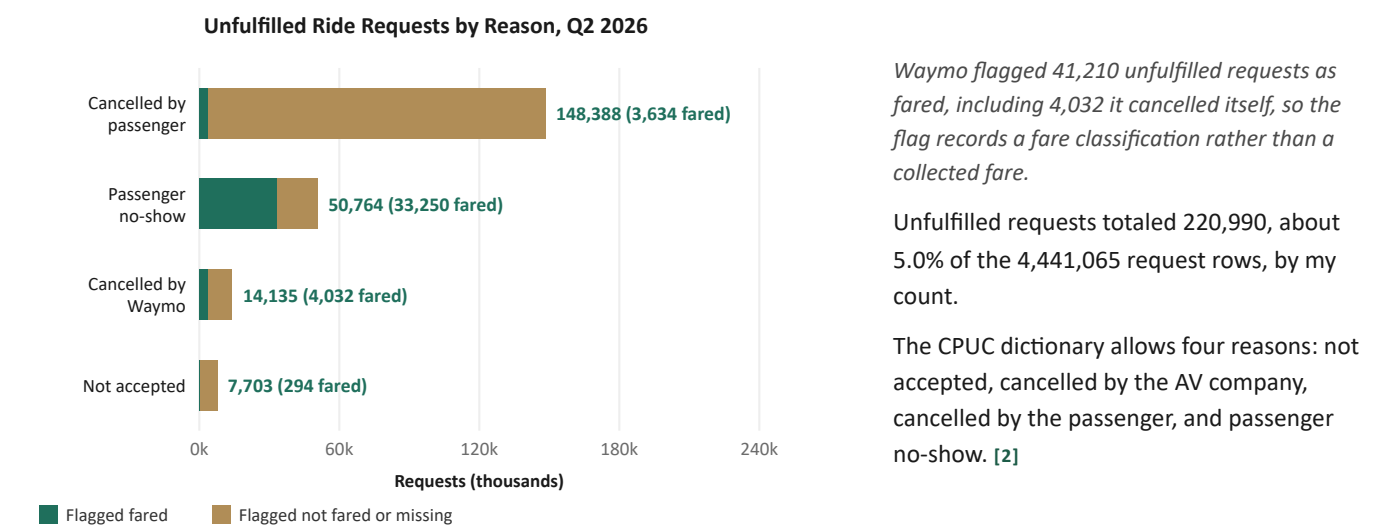
- Period 1:** logged in since the prior trip, neither carrying a passenger nor en route to a pickup.
- Period 2:** request accepted, driving to the pickup.
- Period 3:** pickup to drop-off. Shared-ride overlap is netted in the monthly aggregates.

Quarter measure (Apr.–Jun. 2026)	Value	Label
Completed trips	4,220,075	Reported [1, 2]
Total vehicle miles (all periods)	28,143,284.70	Reported
Period 3 miles	16,579,724.92	Reported
Periods 1 + 2 miles; share of total	11,563,559.78; 41.09%	Author calculation
All miles per Period 3 mile	1.697	Author calculation
Period 3 miles per completed trip; all miles per trip	3.93; 6.67	Author calculation
Passengers carried; per completed trip	6,661,406; 1.58	Reported; author calculation
Passenger miles; per Period 3 mile	25,192,266.02; 1.52	Reported; author calculation
Vehicle waiting hours between trips (time vehicles wait for a request)	1,165,724	Reported

What the mileage periods do not show

Periods 1 and 2 are service mileage without a rider aboard. They carry no fare classification and no unit cost, so the 41.1% share measures the repositioning and pickup burden of the California fleet. Active fleet hours and in-person retrievals are not in the published data.

Fared Classification and Unfulfilled Requests



Completed trips, Q2 2026	Count	Share	Label
Flagged fared	4,155,530	98.47%	Author count of filed rows
Flagged not fared	64,205	1.52%	Author count of filed rows
FaredRide missing (literal NULL)	340	0.01%	Author count of filed rows
Total completed	4,220,075	100%	Equals CPUC monthly total [1]

How I counted

I tallied the five trip-level files directly. The CPUC dictionary defines *FaredRide* as whether the ride was fared, Y or N, and the files hold 4,441,065 rows with 4,441,065 unique RideIDs and no shared or pooled flags.

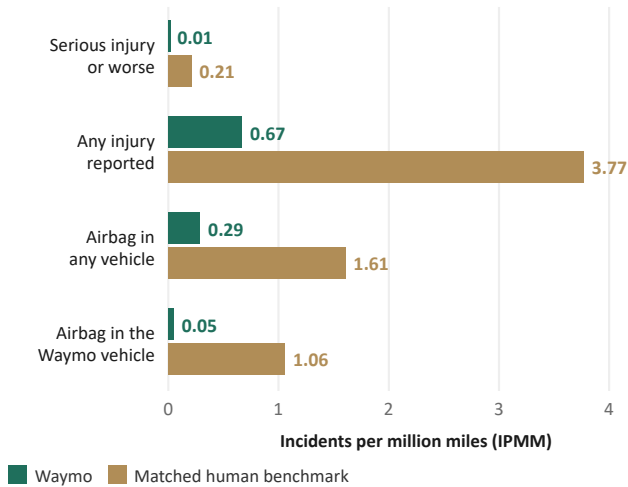
Reproducibility	Detail
Files	PSG0038152_2026_08_AV_Trips_Part0 to Part4-Deployment-Public.csv (five files), from the CPUC Q2 2026 ZIP
Columns	RideID (uniqueness check), TripFulfilled (Y = completed), FaredRide (Y, N or NULL), ReasonUnfulfilled, NumberPassengers, PoolRequest and SharedProvided (N on every row)
Filtering	Header rows skipped; no rows dropped or deduplicated; completed trips are rows with TripFulfilled = Y
Reconciliation	Completed rows match the monthly 4,220,075 trips; non-missing NumberPassengers on completed rows sum to the monthly 6,661,406, with 580 completed rows lacking a passenger count

How the fared flag is read

A fared trip here is a classified trip in Waymo's California deployment program for one quarter. It is not net revenue, it may include promotional or subsidized rides that Waymo's filing narrative describes, and it cannot be projected to Waymo's other cities.

Waymo's Injury-Crash Record on Surface Streets

Crash Rates per Million Rider-Only Miles, Through June 2026



Waymo's published rates sit 82% to 95% below its matched human benchmarks on every injury and airbag outcome, across 271.3 million rider-only miles on surface streets.

The benchmark uses police-reported crashed vehicles on the same road types in the same counties, reweighted to where Waymo drives. Freeways are excluded.

The any-injury benchmark adds a 32% under-reporting adjustment; the others do not.

Outcome	Waymo	Benchmark	Difference	Basis
Serious injury or worse	0.01	0.21	-94.8%	Company analysis [3, 6]
Any injury reported	0.67	3.77	-82.1%	Company analysis [3]
Airbag in any vehicle	0.29	1.61	-81.7%	Company analysis [3]
Airbag in the Waymo vehicle	0.05	1.06	-95.5%	Company analysis [3]

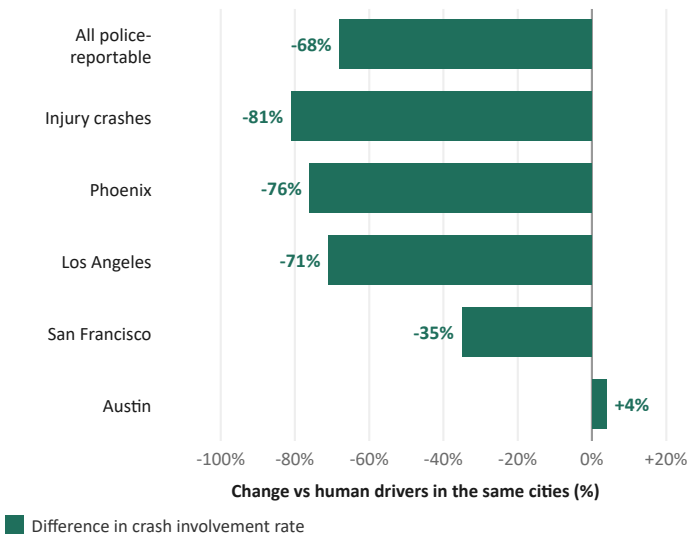
Rider-only miles by metro, through June 2026	Phoenix	Bay Area	Los Angeles	Austin	Atlanta
Millions of miles (company-reported)	92.121	82.421	67.098	21.064	8.624

What the hub covers

The hub counts every crash Waymo reported under NHTSA's Standing General Order, whoever was at fault. It covers surface streets in cities without appreciable snowfall, and Waymo states it lacks the mileage to test fatalities on their own. The serious-injury category depends on police reports Waymo obtained; cases without one are marked unknown.

An Independent Check and Its Limits

IIHS: Waymo Driverless Crash Involvement vs Human Drivers, 2021–2024



An independent analysis found Waymo's driverless vehicles in 68% fewer police-reportable crashes per mile than human drivers in four cities from 2021 to 2024, although Austin's small sample showed 4% more.

IIHS counted 64 police-reportable driverless Waymo crash involvements over about 50 million miles, against about 222 billion human miles in the same places and period.

IIHS is funded by auto insurers. [\[4, 5\]](#)

Dimension	Waymo safety hub	IIHS study
Author	Waymo	IIHS, independent of Waymo
Period and miles	Sept. 2020 to June 2026; 271.3M rider-only miles	2021 to 2024; about 50M driverless miles
Cities	Phoenix, Bay Area, LA, Austin, Atlanta	Phoenix, San Francisco, LA, Austin
Crash definition	All SGO-reported crashes with the outcome	SGO crashes IIHS judged police-reportable
Exposure source	Waymo-reported miles	Waymo-reported miles; no exposure audit

Limits I keep on both

Neither analysis covers freeways, snow, new cities or Waymo's newest vehicle platform at scale, and neither can test fatality rates yet. RAND's 2016 analysis showed how many hundreds of millions of miles a fatality comparison needs; I treat it as an illustration of statistical power and set no regulatory threshold from it. In July 2026 IIHS concluded that the federal reporting system lacks the mileage data needed to monitor a large-scale expansion, because only Waymo then supplied driverless mileage. Tesla and Aurora have since reported driverless miles in their own formats [\[8, 38\]](#), although no mandatory, comparable industry denominator exists.

Why the Operators Cannot Be Ranked

Item	Waymo safety hub	Tesla Robotaxi safety report
Period and miles	Through June 2026; 271.3M rider-only miles	Jan. 22 to Oct. 18, 2026; 2.95M Texas miles, 95% of its total
Remote role in the miles	Remote assistance supplies information or advice to the driving system	Includes miles where a remote operator assisted or took control
Injury numerator	Crashes with any injury, regardless of fault	Persons injured in collisions where the Robotaxi made first contact
Injury benchmark	Police-reported crashed vehicles, 32% under-reporting adjustment	Injury collisions whoever made first contact, 2024 TxDOT records, 32% adjustment
Airbag measure	Both any-vehicle and own-vehicle: own-vehicle 0.05 vs 1.06 IPMM	Own-vehicle only: zero deployments vs about 4.1 expected
Benchmark period	2022 police-report benchmark, reweighted by location, against Sept. 2020 to June 2026 operations	2024 human records against 2026 operations

Own-vehicle airbag deployment is the closest-matched event definition between the two operators. Even so, the geographies differ, Waymo's exposure is about 90 times larger, and Tesla's injury numerator and benchmark count different things, so I make no cross-operator safety ranking. The Tesla page shows a data window ending October 18 and no publication date; I cite it as retrieved October 22, 2026.

Federal crash reports by operator

Reporting entity	Unique reports	Operator type: None	In-vehicle or remote	Other, see narrative
Waymo	1,283	1,217	65	1
Avride	81	0	81	0
Zoox	78	46	32	0
Tesla	36	29	7	0
May Mobility	20	0	20	0
Motional	15	0	15	0
Aurora	8	0	8	0
All others (12 entities)	30	0	30	0
Total (19 entities)	1,551	1,292	258	1

Source [10, 11]: NHTSA Standing General Order ADS incident file, which NHTSA states covers June 16, 2025 to September 15, 2026, retrieved October 22, 2026. I kept the latest Report Version for each Report ID (1,595 rows, 1,551 report IDs). "None" is the literal Driver / Operator Type value as reported. These are report counts that NHTSA has not adjudicated as unique crashes, they carry no mileage and support no crash ranking, and earlier reports filed under pre-June 16, 2025 thresholds sit in separate archive files.

School Buses and Remote Advice

Date	Event	Label
Aug. 20, 2025	Waymo driverless software release that later produced the school-bus behavior; broadly deployed mid-September	Reported [12]
Sept. 22, 2025	First known event: a Waymo slowed for a school bus, then proceeded before the stop arm retracted	Reported [12]
Oct. 17, 2025	NHTSA opens preliminary evaluation PE25013	Reported [13]
Nov. 5–17, 2025	Software remedy deployed to all 3,067 affected 5th-generation vehicles	Reported [12]
Dec. 10, 2025	Recall 25E084 filed; 12 citations Sept. 25 to Nov. 14; no collisions	Reported [12]
Jan. 12, 2026	Austin: an unoccupied Waymo stopped for a loading school bus, asked remote assistance whether the bus had active signals, was told "No" by an agent in Novi, Michigan, then passed with stop arms extended; no crash	Reported [13]
Jan. 14, 2026	Second Austin event, on a special-needs bus route	Reported [13]
Mar. 3, 2026	NTSB preliminary released; probable cause pending	Reported [13]

What the January event shows

The January 12 event came after the remedy was deployed. The NTSB preliminary does not give the vehicle's software build, and it has not determined whether the recalled behavior recurred. It shows residual school-bus risk after the remedy, without proving recurrence of the recalled defect, and a case where incorrect remote advice was followed by an illegal pass. Assessing it needs both the remote advice and the driving system's response to that advice; probable cause is pending.

Remote assistance: what seven operators told Congress

Finding	Source and label
Every one of seven operators (Aurora, May Mobility, Motional, Nuro, Tesla, Waymo, Zoox) declined to disclose how often remote assistants intervene	Congressional report [14]
Waymo reported about 70 remote-assistance agents on duty worldwide against about 400,000 trips and 4 million miles a week; this is on-duty staffing and says nothing about total labor cost	Company response [15]
Half of Waymo's remote assistants work overseas with local licenses; one-way latency about 250 ms overseas vs 150 ms in the U.S.	Congressional report [14]
Tesla says its remote operators can take control and drive at up to 10 mph; Aurora says its design does not allow remote steering, braking or acceleration	Company responses [14, 15]
California's Q2 stoppage files exist; the incident file's contents and the fleet-level manual-removal counts are fully redacted	Regulator file [1, 2]

Who Can Stop or Shape Deployment

Authority or party	Action	Status and label
California DMV	New rules (Apr. 28, 2026): heavy-duty AVs allowed; testing with a driver, then driverless, then deployment, with 50,000 (light) or 500,000 (heavy) miles per phase; 30-second response to emergency officials	Reported; phased effect [52]
CPUC	Separate permits to charge fares; quarterly data filings with trip-level files	Reported [1]
Texas DMV	Active authorization required for commercial automated vehicles from May 28, 2026	Reported [53]
NHTSA	Crash reporting under the Standing General Order; recall oversight	Reported [11, 12]
NTSB	School-bus investigation HWY26FH007	Ongoing [13]
Sen. Markey	Remote-assistance investigation and findings	Reported [14]
U.S. House committee	BUILD America 250 Act with a national AV truck framework, passed committee 62–2 in May 2026	Company account; pending [38]
Teamsters	Suit filed Aug. 5, 2026 in Alameda Superior Court seeking repeal of the heavy-duty rules	Allegation, no ruling [54]

Counterforces outside the vehicle

Counterforce	Why it matters to the branches
Curbs, airports, fire and police	Pickup rules and first-responder interaction set where and when service can run; California now requires a 30-second response to emergency officials
Accessibility	Waymo's California wheelchair-accessible trips run through a partner using conventional vans: 2,557 in the quarter. Autonomous wheelchair capacity is not shown
Human ride-hail, taxis and transit	Competing supply sets fares and utilization; added vehicle miles can divert transit riders
Staffed trucking and rail	Freight buyers compare driverless lanes with staffed trucks and intermodal rail on cost and reliability
Labor	Driver unions oppose driverless trucks in court and in state legislatures

Three Freight Domains, Three Different Tests

Subrow	Operator	Driver-out record	Label
Permian sand	Kodiak with Atlas	35 customer-owned driverless trucks at June 30 (28 at Mar. 31); 40,000+ cumulative paid driverless hours; 20,000+ cumulative loads; 300,000+ tons in Q2; target 100 trucks by mid-2027	Reported; target [44, 46]
Permian sand	Aurora with Detmar	Driver-out runs between Midland and Capital Sand's Monahans site on I-20	Company [38]
Open-highway Class 8	Aurora	Nearly 440,000 cumulative driverless miles at June 30 inside 6M+ commercial miles; >500,000 driverless miles by Sept. 23; >225,000 annualized miles per truck for selected customers; rear-seat roadside staff on some trips; 200 trucks by year-end allocated under contracts	Reported (Q2); furnished 8-K; target [38, 39, 40, 43]
Open-highway Class 8	Kodiak; Volvo VAS; Waabi	Kodiak targets unsupervised Dallas–Houston service with IKEA on I-45 by end-2026 (readiness measure 96% at end-September; safety observer still aboard in launch-program runs); Volvo targets driverless operation in Q1 2027; the Waabi Driver on Volvo VNL Autonomous hauls Warp freight with an observer in the driver's seat	Target; secondary [45, 47, 38, 49]
Middle-mile and regional	Gatik; Pony	Gatik states daily driverless networks and cites \$600M+ contracted revenue over several years; Pony runs driverless trucks at Mawan port, China	Company [48, 36]

What the freight record establishes

Permian sand hauling is the most repeatable driver-out freight domain on the record: customer-owned trucks, paid hours and loads that Kodiak reports each quarter. Highway service exists at Aurora, although nearly 440,000 driverless miles against more than 6M cumulative commercial miles at June 30 puts the driverless share below about 7.3%, by my calculation, and its revenue mixes driverless and supervised loads.

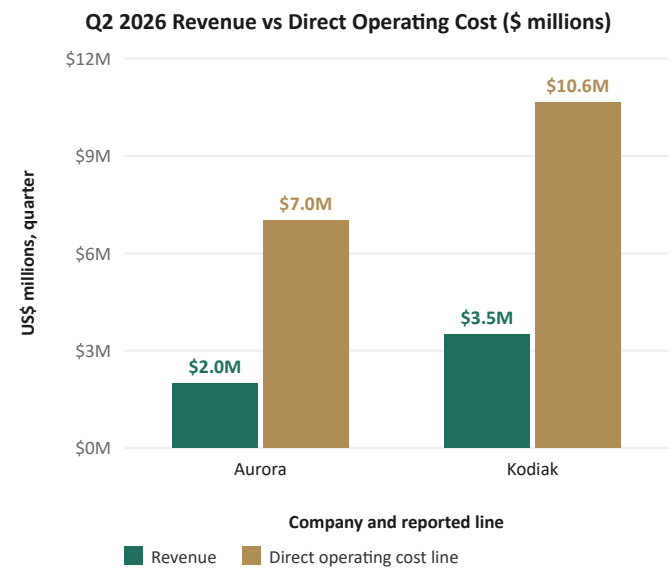
What it does not establish

Neither company reports paid loaded miles, empty-mile ratio, active truck-hours or lane-level contribution. No independent safety analysis of driverless trucks exists in the records reviewed; the collision record is company-reported, and Aurora's "zero Aurora Driver-attributed collisions" reflects its own fault attribution.

Why the freight subrows are tested apart

Subrow	Unit of output	Buyer	Cost lines that decide it
Permian sand	Loads, tons and paid hours on short repeat routes	Sand and oilfield logistics customers that own the trucks	Truck ownership, upfit, site staff, short-route utilization
Middle-mile and regional	Repeat runs between fixed depots	Retail and distribution shippers	Box-truck hardware, depot handling, route density
Open-highway Class 8	Loaded miles on long lanes	Carriers and shippers	Hardware, terminals, fuel, insurance, empty miles

Revenue Covers a Fraction of Direct Cost



Both freight pure-plays spent roughly 3.0 to 3.5 times their quarterly revenue on their direct operating cost line (Aurora $7/2 = 3.5x$; Kodiak $10.649/3.499 = 3.04x$, by my calculation), before research and corporate costs.

Aurora's line is cost of revenue; its revenue mixes driverless and supervised loads. Kodiak's line is truck and freight operations expense.

The two lines are defined differently, so the bars show scale within each company and are not compared across them.

Q2 2026 item	Aurora	Kodiak	Label
Revenue	\$2M (driverless and supervised loads)	\$3.499M	Reported [38, 44]
Direct operating cost line	\$7M cost of revenue	\$10.649M truck and freight operations	Reported
Loss from operations	\$266M	\$43.677M	Reported
Net result	Net loss \$270M	Net income \$12.477M, from a \$58.28M warrant revaluation gain	Reported
Operating cash used	About \$225M	\$34.125M	Reported
Cash and investments, June 30	Nearly \$1.2B	\$151.1M	Reported
Equity raised	30M shares at-the-market, \$215M net (Q2)	\$100M private placement (H1)	Reported [41, 44]
Guidance or target	FY2026 revenue \$14M–\$16M; quarterly cash use \$190M–\$220M	Long-haul driver-out by end-2026	Company target [38, 45]

What these numbers cannot show

Company losses mix early research spending with operations, so they say little about the contribution of a mature lane. Driver-as-a-Service moves truck ownership to the carrier, which leaves hardware, maintenance, terminals, fuel and insurance in the system. The economic gate needs ADS-provider lane or DaaS gross profit and the carrier's cost per loaded mile, and neither appears in the records reviewed. The company ratios above are context only and prove nothing for a domain.

Which Products Carry the Passenger Test

Each company enters the thesis through a named product and a named domain. The contribution column holds the dated measure that company reports; the exposure column says how much of its business rides on the catalyst; figures in different units or windows are never combined.

Company: product	Domain and role	Dated contribution	Economic exposure	Limits
Waymo (Alphabet): Waymo Driver across distinct vehicle and generation programs, including 5th-generation Jaguar I-Pace and 6th-generation Ojai	U.S. surface streets in five metros; Las Vegas public riders from Sept. 14, 2026 on a majority-Ojai fleet; LAS airport from Oct. 21; owner-operator	271.3M rider-only miles through June 2026; 4,220,075 completed California trips in Q2 2026 [3, 1, 21]	Reported inside Alphabet Other Bets, a multi-business segment: Q2 revenue \$382M, operating loss \$1,799M [16]	No Waymo P&L; fared flag is a classification; the historic miles and California trips do not transfer to Ojai or Las Vegas
Zoox (Amazon): purpose-built robotaxi	Las Vegas public service with airport rides; free San Francisco rides; owner-operator	Nearly 2M robotaxi miles and 350,000+ riders (Apr. 29, 2026); 46 SGO reports with operator type None [23, 10]	Inside Amazon; no Zoox financials in the release reviewed	Fare collection unconfirmed; no matched safety denominator
Tesla: Robotaxi service, including Cybercab rides in Austin from Sept. 3	Texas cities, plus Florida miles in its safety report; owner-operator; remote operators may drive at up to 10 mph	Q3 deck: nearly 2M cumulative unsupervised miles at Sept. 30. Safety report: 2.95M Texas miles, Jan. 22 to Oct. 18 [9, 8, 14]	Inside an automotive and energy company; no robotaxi revenue disclosed	The two mileage figures are not reconciled in Tesla's disclosures; first-contact injury numerator
Baidu: Apollo Go autonomous ride-hailing	China plus a 28-city footprint that includes testing cities; operator	3.2M fully driverless operational rides in Q1 2026; 240M+ fully driverless km to date (Q2) [34, 33]	Inside diversified Baidu; Apollo Go economics not isolated	Operational rides are not fares; kilometers never added to U.S. miles
WeRide: Robotaxi, within an L4 fleet that also includes robobuses	China and overseas, including ~400 Middle East robotaxis; operator and technology supplier	1,800+ robotaxis of ~3,400 L4 vehicles at July 31; 21+ daily rides per domestic vehicle in Q2 [37, 35]	H1 2026 revenue RMB345.9M spans L4 and L2++/L3 [35]	Robotaxi-only revenue and cost not isolated
Pony.ai: robotaxi services on Gen-7 vehicles (BAIC, GAC, Toyota) via PonyPilot and partner apps	Chinese tier-one cities; Luxembourg and Singapore partners; Uber contract for 2,000+ vehicles in Europe	1,975 robotaxis at June 30; robotaxi services revenue \$12.1M in Q2 [36]	Robotaxi services 33% of Q2 revenue; 17.5% gross margin is consolidated [36]	Revenue includes joint-deployment income; positive unit economics is a company claim without a cost bridge

Which Products Carry the Freight Test

Company: product	Domain and role	Dated contribution	Economic exposure	Limits
Aurora: Aurora Driver in two programs. Gen2 kit on Roush-upfit International LT, driverless from July 2026; Volvo VNL Autonomous run by Volvo Autonomous Solutions, driverless targeted Q1 2027	Open-highway Class 8 in Texas; Permian sand for Detmar on I-20; Transportation as a Service now, Driver as a Service from 2027	Nearly 440,000 cumulative driverless miles at June 30 across the published fleet, not specific to Gen2 or Volvo; >500,000 by Sept. 23 (furnished 8-K); Q2 revenue \$2M incl. supervised loads [38, 40]	Pure-play: Q2 loss from operations \$266M; cost of revenue \$7M [38]	Driver-out share of loads undisclosed; rear-seat support staff on some trips; no independent safety study
Kodiak: Kodiak Driver (Gen7 platform) on customer-owned Atlas trucks	Permian sand along Atlas's Dune Express load-outs; Dallas–Houston long haul targeted with IKEA	35 driverless trucks at June 30; 40,000+ cumulative paid driverless hours; Q2 revenue \$3.499M [44]	Pure-play: truck and freight operations \$10.649M; loss from operations \$43.677M [44]	Atlas public-road operation planned for early 2027; long haul still has a safety observer aboard [46, 47]
Gatik: middle-mile delivery service	Repeat depot-to-store routes in the U.S. and Canada	Company states daily driverless networks; no dated volume published [48]	Private; cites \$600M+ contracted revenue over several years	Company claims only

Freight suppliers and vehicle platforms

Contributor	Product or service and status	Achieved operational contribution	Program or business impact	Unknowns
Roush	Upfit of International LT trucks with the Aurora Gen2 kit	Initial builds received; volume upfitting begun [38, 40]	Targeted 20 trucks a week in October	Actual weekly output
International; Volvo; PACCAR	Truck bases: International LT (in service), Volvo VNL Autonomous (VAS operations), future PACCAR platform (model unspecified)	LT and VNL in commercial service [38]	VAS targets driverless Q1 2027 and 300+ trucks exiting 2027; PACCAR in planning	PACCAR model and timing
AUMOVIO (formerly Continental)	Third-generation Aurora hardware kit and an independent fallback computer	Volvo development trucks built with kit components [38, 42]	Start of production planned H2 2027	Kit cost; fallback performance
NVIDIA	Dual DRIVE Thor with DriveOS for the future Aurora primary computer	None disclosed in the current fleet [42]	Arrives with the third-generation kit	Content and cost per truck

Who Enables the Carriers, and How

Enabling companies are recorded by the service they provide to a named operator. Their contribution is a role in the evidence chain; none of them reports driver-out economics in the records reviewed.

Contributor	Product or service and status	Achieved operational contribution	Program or business impact	Unknowns
Magna	Waymo vehicle integration plant, Mesa, Ariz.	Plant operating for Waymo [22]	Capacity of tens of thousands a year is an aspiration	Units integrated; contract value
EVgo; Terawatt; Voltera	Waymo-listed EV charging partners that help keep the fleet charged	Listed by Waymo; no site count, capacity or charging volume disclosed [26]	Tariffs and contract economics undisclosed	Sites, kWh, uptime and cost per vehicle
Uber; Lyft	Rider matching: Waymo on Uber (Austin, Atlanta) and Lyft (Nashville from Sept. 9, 2026)	Trips matched, count undisclosed [26, 25]	Take rate and revenue split undisclosed	Share of Waymo trips by channel
Flexdrive (Lyft); Moove	Fleet management and road-readiness for Waymo; Nashville depot planned for October	Service under way [25, 26]	Contract economics undisclosed	Vehicles serviced; cost per vehicle
Remote assistance	Waymo, Tesla and Aurora remote teams	Waymo ~70 agents on duty, half overseas; Tesla remote driving up to 10 mph; Aurora no remote control [14, 15]	Labor cost undisclosed	Intervention frequency, withheld by all seven companies queried
Swiss Re	Collaborator on Waymo liability-claims studies	Claims-frequency research [3]	Not identified as fleet insurer; no premium inferred	Insurer, premium and retained risk

Counting rule

One completed trip or load is counted once, at the operator that carried it. Supplier, fleet, charging and distribution contributions are linked to that service, and payments between them are transfers that add no systemwide benefit. Each item is read against one operator, platform and domain, so Lyft matching in Nashville says nothing about Phoenix.

WATCH ROWS AND FREIGHT CUSTOMERS

Named Paths Outside the Six Measured Domains

These named paths are watched without entering any measured domain. None of their output is added to robotaxi, transit, delivery or Class 8 figures.

Path	Named service and role	Dated status	Contribution counted	Economics
Motional via Uber, Las Vegas	Motional robotaxi service matched in the Uber app (Strip, Downtown, Town Square)	Supervised service phase from Mar. 13, 2026; rider-only planned later in 2026 [29]	None counted as driver-out	Undisclosed
Nuro Driver on Lucid Gravity via Uber, Houston	Uber matching; vehicles owned by Uber or third-party fleet partners; Uber has a 50,000 sq ft Houston depot	Testing with safety operators; launch expected mid-2027; Uber aims for 20,000+ vehicles over six years (target) [28, 27]	None	Undisclosed
May Mobility with Via, Sun City, Ariz.	Rider-only on-demand transit in Toyota Sienna Autono-MaaS vehicles	Launched Dec. 2023 for select Early Riders; no current volume in records reviewed [51]	Transit; never pooled with ride-hail	Free to riders
Waabi with Volvo for Warp, Dallas–Houston	Waabi Driver on Volvo VNL Autonomous hauling Warp freight	Customer operations from Oct. 5, 2026 with an observer in the driver's seat [49]	None counted as driver-out	Undisclosed
Torc (Daimler Truck subsidiary)	Production-intent autonomy hardware on Gen5 Freightliner Cascadia	Test-track driver-out runs in 2024; U.S. Level 4 entry aimed for 2027 [50]	None on public roads	Undisclosed
Waymo with DoorDash, Phoenix	Road delivery to DoorDash users using Waymo vehicles	Listed on Waymo's undated partner page; no volume published [26]	Delivery; never pooled with rides	Undisclosed

Named freight customers

Contributor	Product or service and status	Achieved operational contribution	Program or business impact	Unknowns
Freight customers	Atlas; Detmar; McLane; Werner; Hirschbach; IKEA Supply; DSV and AVI-SPL (via Volvo); Charger Logistics; Value Truck	Atlas owns 35 trucks [44, 40, 38, 47]	Hirschbach 500-truck plan is a non-binding MOU	Volumes, rates and cost per loaded mile

SIGNIFICANCE INPUTS AND EXTERNAL DRIVERS

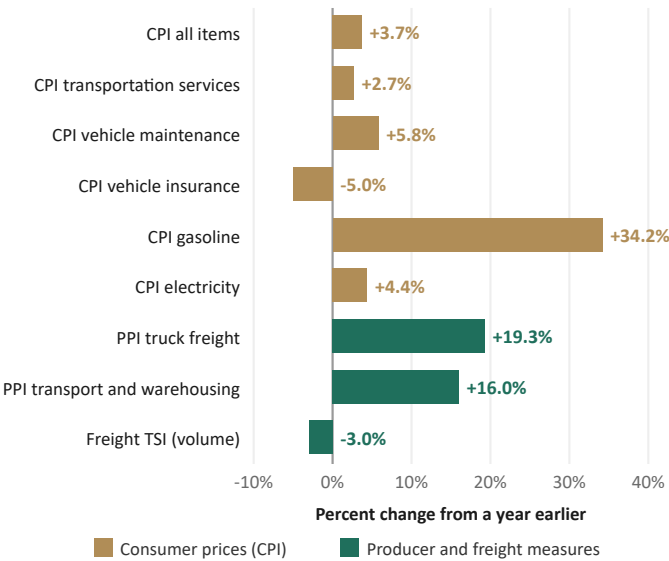
Breadth and the Economy Around It

Expected significance: ★★★★★

The reference is U.S. commercial road transport for passengers and freight. Three stars reflects a deep per-mile change already running in two U.S. domains, with broader deployment still uncertain. Aurora's disclosed target illustrates potential movement into low-single-digit shares of 2024 combination-truck mileage under the stated utilization assumption; it is not an industry ceiling. The for-hire passenger denominator and a comparable 2031 passenger projection are not established here. Foreign examples are separate comparative branch evidence and form no part of U.S. output or this breadth denominator.

Basis	Measured input	Label
Reference	U.S. commercial road transport: for-hire passenger rides and combination-truck freight. FHWA 2024: 192,520M combination-truck miles and 3,482,896 registered combination trucks; 2,924,107M light-duty miles cover all light-duty travel and measure no commercial passenger share, since FHWA publishes no for-hire figure	Reported [55]
Measured scale	Waymo reported about 4M fully autonomous miles a week in Feb. 2026, about 208M a year if sustained, or 0.007% of all light-duty miles, which is no for-hire share; freight driver-out miles are in the hundreds of thousands against 192.5B	Company; author calculation [15, 40]
Trend	Kodiak trucks 28 to 35 in Q2; Aurora driverless miles ~440,000 (June 30) to >500,000 (Sept. 23); Waymo at 15 U.S. cities by Sept. 2026	Reported; furnished [44, 40, 19]
One-company illustrative sensitivity	Aurora's disclosed 2030 target of 30,000+ trucks would be 0.86% of registered combination trucks and, at the >225,000 annualized miles reported for selected customers, about 6.75B miles or 3.5% of 2024 combination-truck miles	One-company illustrative sensitivity, using selected-customer utilization; not a fleetwide forecast [40, 55]
Historical pattern	Each affected mile loses its onboard driver; reversals occur, as with California's 2023 Cruise suspension and GM's later wind-down	Reported [31, 32]

External Price and Freight-Volume Measures, Year-over-Year Change



The truck freight producer price index rose 19.3% in a year while multimodal freight volume fell 3.0%, so any driverless revenue-per-mile gain must be separated from this pricing cycle, freight mix and fuel.

CPI and PPI are unadjusted September 2026 changes; the freight index is seasonally adjusted, August 2026. [56, 57, 59]

Diesel retailed at \$6.276 a gallon nationally and \$8.242 in California in the week of October 19. [58]

EXTERNAL ECONOMIC DRIVERS

Prices That Move Both Staffed and Driverless Costs

Measure	Latest value	What it can inform	What it cannot show
CPI motor vehicle insurance	-5.0%, Sept. 2026, 12-month	Consumer insurance pricing trend	Commercial fleet premiums or AV claims [56]
CPI maintenance and repair	+5.8%	Labor and parts inflation	Sensor or ADS hardware repair cost [56]
CPI gasoline; electricity	+34.2%; +4.4%	Fuel cost pressure on human ride-hail drivers	Depot charging tariffs or demand charges [56]
PPI truck transportation of freight	+19.3% 12-month; +3.8% month on month (preliminary)	Freight price environment	Volume, margin or driverless revenue [57]
PPI transportation and warehousing	+16.0%; +3.4% month on month	Broader logistics prices	Lane-level pricing [57]
On-highway diesel, retail	U.S. \$6.276; California \$8.242 (week of Oct. 19)	Fuel cost faced by diesel trucks, staffed or driverless	Contract fuel prices paid by fleets [58]
BTS Freight TSI	134.4, Aug. 2026; -3.0% year on year	Multimodal for-hire freight volume	Trucking alone or driverless share [59]
ATRI operating cost	\$2.336 per mile (2025), +3.4%	Staffed-truck cost benchmark	Driverless cost per mile [60]

No shortcut from price indexes to driverless margins

Consumer gasoline prices are no measure of an electric robotaxi fleet's energy cost, and producer freight prices are no measure of a driverless carrier's margin. These series describe the cost and price environment both staffed and driverless operators face, so I use them only as context for the economic gate.

Measures still sought

Local driver wages and benefits, commercial electricity tariffs and demand charges, commercial auto insurance premiums and claim severity, fleet financing and residual values, contract and spot freight rates excluding fuel, tender rejections, ride-hail and airport demand, and weather cancellations. None was located in a form tied to driverless operations in the records reviewed.

Comparator assessment

The comparator for passenger service is human ride-hail and taxi supply in the same city, and for freight it is a staffed truck on the same lane. Neither comparison can be made on cost today, because the records reviewed establish no comparable driver-out cost per trip or per loaded mile. For safety, Waymo's matched human benchmark is the only published comparator with an independent check.

COUNTERCASE

Why the Catalyst Could Stall

The countercase is a claim about the catalyst: that driver-out service stays narrow, assisted and uneconomic in every domain, whatever any one company reports.

Alternative	Why it remains plausible	What would confirm it
Domain narrowness	Safety and utilization come from mild-weather surface streets and short repeat routes	Higher crash or stoppage rates in winter, freeway or new-city service
Remote and field labor fail to scale	The seven companies Senator Markey queried withheld intervention frequency; Waymo's California stoppage file is redacted	Staff cost, manual retrievals or intervention time per driver-out mile or trip failing to improve or rising
Hardware cost and life unproven	Aurora's one-million-mile kit life and 50%+ cost cut are design targets	Observed replacement rates or kit costs above target
Promotional demand	Free and subsidized rides exist; no promotion-adjusted revenue appears in the records reviewed	Trips falling as promotions end, or fares below cost
Freight price cycle	The PPI index for truck transportation of freight rose 19.3% in a year, a pricing confounder	Driverless revenue per mile tracking the index once freight mix and fuel are separated
Regulatory reversal	California suspended Cruise's permits in October 2023, and GM later wound Cruise down [31, 32]	Permit suspensions or narrowed domains after an incident
Labor and political opposition	The Teamsters sued California's DMV over driverless trucks in August 2026	Court orders or statutes requiring an onboard operator

Baseline values the counterevidence would move

Signal	Baseline value and period	Dataset and label
Repositioning burden (Periods 1 + 2 share of miles)	41.09% (Q2 2026)	CPUC; author calculation [1]
Unfulfilled share of ride requests	4.98% (220,990 of 4,441,065)	CPUC trip files; author count [1]
Requests Waymo cancelled or did not accept	21,838	CPUC trip files; author count [1]
Completed trips flagged fared	98.47%	CPUC trip files; classification only [1]
Federal crash reports, Waymo, operator type None	1,217 (latest version per report ID; file covering June 16, 2025 to Sept. 15, 2026)	NHTSA SGO; author count; reporting thresholds changed June 16, 2025, so counts are not comparable across that change [10, 11]
Kodiak cumulative paid driverless hours	40,000+	Reported [44]

CATALYST GATES

The Catalyst, Read Domain by Domain

Passenger branch

Domain and evidence carriers	Useful and repeatable	Safe	Economically viable	Outcome status
U.S. surface streets: Waymo Driver; Tesla Robotaxi; Zoox robotaxi	Met for Waymo: 4.22M California trips in Q2; Tesla and Zoox shorter records	Supported for Waymo, four cities, 2021–24 (IIHS pooled –81% injury crashes); none independent for Tesla or Zoox	Unresolved: no driver-out P&L in disclosures reviewed	Ungraded
Freeways and airports: Waymo Driver	Early: limited freeway miles; LAS airport from Oct. 21	Outside both published safety analyses	Unresolved	Ungraded
China ride-hail: Apollo Go; Pony.ai robotaxi; WeRide Robotaxi	Operating at scale under company definitions	No independent analysis reviewed	Unresolved: Pony robotaxi revenue \$12.1M without a cost bridge; Baidu and WeRide not isolated	Ungraded

Freight branch

Domain and evidence carriers	Useful and repeatable	Safe	Economically viable	Outcome status
Permian sand: Kodiak Driver on Atlas trucks; Aurora Driver for Detmar	Met: 35 trucks, 40,000+ paid driverless hours	No independent analysis; company record only	Unresolved: no Permian contribution, Kodiak service margin or Atlas delivered cost per ton established	Ungraded
Middle-mile: Gatik; Pony.ai Robotruck at Mawan port	Company claims only	No independent analysis	Unresolved	Ungraded
Open-highway Class 8: Aurora Driver; Kodiak, Volvo VAS pending	Early: ~440,000 driverless miles; share of loads undisclosed	Company-reported only	Unresolved: no lane or DaaS contribution or carrier cost per loaded mile established; Aurora revenue mixes supervised loads	Ungraded

Catalyst synthesis

Useful, repeatable driver-out service is established in U.S. surface-street ride-hail and Permian sand hauling and emerging elsewhere under company definitions. Independent safety support covers Waymo's historic cities for 2021–24, and economic viability is unresolved in every domain. The catalyst is partly realized in operations and unproven economically, with no blended verdict.

A Real Shift, a Test That Needs Disclosure

Dimension	Reading	Reason
Attribution feasibility	Moderate for operations, low for economics	Regulator files isolate driver-out trips in California; no filing reviewed isolates comparable driver-out profit
Future measurability	Conditional	CPUC quarterly files, SGO reports and pure-play results recur; cost and intervention data do not
Disclosure risk	High	California redacts stoppage contents; the seven companies Senator Markey queried withheld intervention frequency
Reversibility	Moderate	Permits can be suspended after an incident, as California did with Cruise in 2023 [31]
Observation mode	Ongoing	Review each passenger and freight domain against dated evidence; no fixed terminal

What each test must observe

Test	Metric and primary source	Missing-data behavior
Passenger volume	Completed trips, passengers, Period 1–3 miles; CPUC quarterly files	Outside California: checked operator and jurisdiction records; not located in reviewed sources
Fared share	FaredRide flag, California deployment only	Never projected to other cities
Passenger safety	Waymo hub updates; any new independent study	Operator-only data stays labeled
Freight volume	Driverless trucks, paid hours, loads, driverless miles	Blended miles not treated as driverless
Remote layer	Intervention or retrieval counts if ever filed	Redacted files recorded as redacted
Economics	Segment, lane or DaaS gross profit; carrier cost per loaded mile	Consolidated losses cannot pass the gate

Quarterly contributor update

At each quarterly review, update the linked contributor rows on pages 15–17: qualified/commissioned vehicles; fleet availability and turnaround; charging volume, uptime and cost; channel-completed trips and net fees; recurring freight loads and renewals; supervised-to-driver-out transitions. Record achieved contribution, next milestone, separate commercial economics, evidence status and remaining unknowns by operator, platform and domain.

Absence-evidence rule

A missing figure is recorded as not located in the records reviewed through the stated date, and as not disclosed only where a filing would reasonably have shown it.

NEXT MEASUREMENT

What the Next Filing Cycle Has to Show

Occasion	Timing	What gets reopened
Aurora and Kodiak Q3 2026 results	Late October to mid-November; dates not confirmed in the records reviewed	Driverless miles, trucks in operation, revenue mix, cost of revenue; Kodiak paid hours
Pony, Baidu, WeRide Q3 2026	November	Fleet, rides and segment revenue under each company's definitions
CPUC Q3 2026 Waymo filing	By mid-November if published on the Q2 pattern	Trips, Period 1–3 miles, fared classification, unfulfilled requests
Waymo safety hub update	Aligned with SGO reporting	Rates and miles through September 2026
Waymo weekly-ride target	Dec. 31, 2026	Over 1M rides a week, scored as stated
Aurora year-end targets	Dec. 31, 2026	200 trucks operating; FY revenue \$14M–\$16M recognized
Kodiak long-haul launch	By end-2026	Unsupervised Dallas–Houston service with IKEA
NTSB HWY26FH007	Not scheduled	Probable cause and recommendations on remote assistance
Winter operations	December to March	Any driver-out service in snow; none in the current safety record
2027 milestones	Q1 to mid-2027	Volvo driverless operation; Atlas 100 trucks; Nuro Houston launch; Hirschbach deliveries and contract status

Evidence gaps that block a domain reading

Gap	Domains affected	What would close it
Driver-out P&L or contribution	All six domains	Segment, market, lane or DaaS contribution after full cost
Collected and promotion-adjusted fares	All passenger domains	Fare revenue per trip by domain, net of promotions
Intervention, retrieval and remote-labor rates	All six domains	Counts or hours per driver-out mile or trip
Matched independent safety analysis	All domains except Waymo surface streets	Third-party analysis on operator mileage for the same domain
Reconciled Tesla driverless mileage	U.S. surface streets	One mileage series with stated window and seat status
Loaded vs empty miles; active truck-hours	All freight domains	Quarterly freight operating metrics by lane

STANDARDS AND DISCLOSURES

How to Read This Thesis

Term	Definition
Operating domain (ODD)	The roads, areas, speeds, times and weather a driving system is validated to operate in
Driver-out	No human driver or in-vehicle safety monitor at the controls; support staff may ride elsewhere
Rider-only miles	Waymo's term for miles driven with no human driver aboard
Remote assistance	A remote human giving the driving system information or advice; distinct from remote control
CPUC Periods 1, 2, 3	California mileage stages: available without a rider, driving to a pickup, rider aboard
FaredRide	CPUC trip-file flag for whether a ride was fared; it classifies the ride and carries no payment record
SGO	NHTSA Standing General Order requiring crash reports for automated driving systems
TaaS and DaaS	Transportation as a Service (the ADS company hauls the load) and Driver as a Service (the carrier owns the truck and licenses the driving system)
Run-rate	A period figure annualized by the company; not recognized revenue

Period and basis

Quarterly figures are compared only with quarterly figures, cumulative miles only with cumulative miles, and point-in-time fleet counts are kept on their own dates.

Non-GAAP and metric boundary

Company-defined measures such as adjusted EBITDA, free cash flow, run-rate revenue and Kodiak's Autonomy Readiness Measure are reproduced only as the companies present them. None isolates driver-out economics.

Comparator and jurisdiction boundary

Chinese operators report under different rules and definitions, so they are recorded in their own rows and excluded from comparisons with U.S. operators.

Source hierarchy

Regulator files and SEC filings rank first, then issuer releases and furnished investor materials, then company web pages; a secondary copy is used only where the primary page could not be opened, and is labeled.

Research posture

This document tracks an innovation shift across companies. It is not a recommendation, a rating or a price target.

PRIMARY SOURCES

Source Register

#	Document	Use in this thesis
1	California Public Utilities Commission, Waymo LLC AV deployment data, Q2 2026 (monthly, trip-level, stoppage and charging files; reference key; narrative responses, Aug. 3, 2026). https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/consumer-protection-and-enforcement-division/documents/tlab/av-programs/waymo-deployment-2026q2.zip	Trips, Period 1–3 miles, passengers, passenger miles, waiting hours; FaredRide and unfulfilled reasons; partner WAV trips; redacted stoppage files.
2	CPUC, AV deployment data template and dictionary, v2. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/consumer-protection-and-enforcement-division/documents/tlab/av-programs/cpuc-av-deployment-data-template-and-dictionary-av-pd---v2.xlsx	Definitions of Periods 1–3, TotalTrips (completed), FaredRide, RideID, StopID, ManualCount.
3	Waymo, Safety Impact data hub, data through June 2026 (release notes dated Oct. 2, 2026). https://waymo.com/safety/impact/	Rider-only miles by metro; rates vs benchmark; benchmark method; surface streets only; fatality power statement.
4	Insurance Institute for Highway Safety, Waymo's driverless cars crash less often than people, July 23, 2026. https://www.iihs.org/news/detail/waymos-driverless-cars-crash-less-often-than-people	64 involvements over about 50M miles, 2021–24; –68% overall, –81% injury; city results; reporting-system limits.
5	IIHS, Rise of the machines: crash experiences of highly automated vehicles and human drivers (ref. 2374). https://www.iihs.org/research-areas/bibliography/ref/2374	Study record for the IIHS analysis.
6	Kusano et al., Waymo rider-only crash rates by crash type vs human benchmarks at 56.7 million miles, Traffic Injury Prevention (2025). https://arxiv.org/pdf/2505.01515	Company-authored, peer-reviewed method behind the hub's benchmarks.
7	RAND Corporation, Driving to Safety (RR-1478), 2016. https://www.rand.org/content/dam/rand/pubs/research_reports/RR1400/RR1478/RAND_RR1478.pdf	Miles needed for statistical fatality comparisons; illustrative only.
8	Tesla, Robotaxi Safety Report, data Jan. 22 to Oct. 18, 2026 (retrieved Oct. 22, 2026). https://www.tesla.com/robotaxi/safety	2.95M Texas miles; remote-assisted and remote-controlled miles included; first-contact persons-injured numerator; own-airbag measure; 2024 TxDOT benchmark.
9	Tesla, Q3 2026 Update, Oct. 21, 2026, p. 8. https://assets-ir.tesla.com/tesla-contents/IR/TSLA-Q3-2026-Update.pdf	Nearly 2M cumulative unsupervised Robotaxi miles at Sept. 30; Cybercab rides from Sept. 3; Austin hours 6 a.m. to midnight.
10	NHTSA, Standing General Order 2021-01 ADS incident report file, covering June 16, 2025 to Sept. 15, 2026 per NHTSA; retrieved Oct. 22, 2026. https://static.nhtsa.gov/odi/ffdd/sgo-2021-01/SGO-2021-01_Incident_Reports_ADS.csv	1,595 rows, 1,551 latest-version report IDs, 19 entities; counts by entity and Driver / Operator Type, by my count.
11	NHTSA, Standing General Order on crash reporting. https://www.nhtsa.gov/laws-regulations/standing-general-order-crash-reporting	File coverage dates; June 16, 2025 amendment and thresholds.
12	NHTSA, Part 573 Safety Recall Report 25E084, Waymo LLC, Dec. 10, 2025. https://static.nhtsa.gov/odi/rcl/2025/RCLRPT-25E084-7732.pdf	3,067 vehicles; defect logic; remedy Nov. 5–17, 2025; 12 citations; no collisions.
13	NTSB, HWY26FH007 preliminary information, released Mar. 3, 2026. https://www-s.nts.gov/investigations/Pages/HWY26FH007.aspx	Jan. 12 and Jan. 14, 2026 Austin school-bus events; remote-assistance exchange; investigation ongoing.

Source Register, Continued

#	Document	Use in this thesis
14	Office of Sen. Edward J. Markey, Remote Back Seat Operators, 2026. https://www.markey.senate.gov/imo/media/doc/remote_assistance_investigation_report.pdf	All seven companies withheld intervention frequency; overseas staff; latency; Tesla remote driving up to 10 mph.
15	Office of Sen. Markey, company responses to the remote-assistance letter, 2026. https://www.markey.senate.gov/imo/media/doc/company_responses_to_rao_letter.pdf	Waymo's ~70 agents on duty against 400,000 trips a week; Aurora's no-remote-control design.
16	Alphabet, Second Quarter 2026 results, Form 8-K Exhibit 99.1, July 22, 2026. https://www.sec.gov/Archives/edgar/data/1652044/000165204426000066/googexhibit991q22026.htm	Other Bets revenue \$382M and operating loss \$1,799M; segment combines several businesses.
17	Waymo, expansion announcement, Feb. 24, 2026. https://www.waymo.com/blog/2026/02/dallas-houston-san-antonio-orlando/	On track to serve over one million rides per week by end-2026.
18	Waymo, Sustainability page (undated). https://waymo.com/sustainability/	More than 500K fully autonomous EV trips per week.
19	Waymo, Waymo closes \$5 billion debt financing, Oct. 8, 2026. https://waymo.com/blog/2026/10/waymo-closes-5-billion-debt-financing/	\$5B term loan; \$16B equity earlier in 2026; fifteenth U.S. city.
20	Waymo, LAS airport service, Oct. 21, 2026. https://waymo.com/blog/shorts/las-airport/	Airport pickups for current Las Vegas riders, Terminals 1 and 3.
21	Waymo, Ride in Las Vegas, Sept. 14, 2026. https://www.waymo.com/blog/2026/09/ride-in-las-vegas/	Public riders from Sept. 14; majority-Ojai fleet on the sixth-generation Waymo Driver; ~24 sq mi area.
22	Waymo, Scaling our fleet through U.S. manufacturing, May 5, 2025. https://waymo.com/blog/2025/05/scaling-our-fleet-through-us-manufacturing/	Magna plant in Mesa; capacity aspiration of tens of thousands of vehicles a year.
23	Amazon, First Quarter 2026 results, Apr. 29, 2026. https://www.aboutamazon.com/news/company-news/amazon-earnings-q1-2026-report	Zoox: nearly 2M robotaxi miles; 350,000+ riders.
24	Zoox, Community and city pages. https://zoox.com/community/	Service cities; Las Vegas hours and airport rides; free San Francisco rides.
25	Lyft, Waymo rides now available on the Lyft app in Nashville, Sept. 9, 2026. https://www.lyft.com/blog/posts/waymo-rides-now-available-on-the-lyft-app-in-nashville	Lyft app matching to Waymo vehicles in central Nashville; Flexdrive fleet management; no financial terms.
26	Waymo, About page (undated partner list). https://www.waymo.com/about/	Uber in Austin and Atlanta; DoorDash deliveries in Phoenix; Flexdrive by Lyft and Moove fleet support; EVgo, Terawatt and Voltera as EV charging partners.
27	Lucid Group, Lucid, Nuro and Uber partner on next generation autonomous robotaxi program, Form 8-K Exhibit 99.1, July 17, 2025. https://www.sec.gov/Archives/edgar/data/1811210/000110465925068552/tm2520956d2_ex99-1.htm	Lucid Gravity with the Nuro Driver; Uber aims for 20,000+ vehicles over six years, owned by Uber or third-party fleet partners.

Source Register, Continued

#	Document	Use in this thesis
28	Nuro, Uber, Nuro and Lucid to bring robotaxi service to Houston in 2027, June 17, 2026. https://nuro.ai/blog/uber-nuro-and-lucid-to-bring-robotaxi-service-to-houston-in-2027	Testing with safety operators; launch expected mid-2027.
29	Motional, robotaxis available on Uber in Las Vegas, Mar. 13, 2026. https://motional.com/news/motional-robotaxis-now-available-uber-las-vegas	Supervised service phase before rider-only.
30	Avride, autonomous rides on Uber. https://medium.com/avride/60-000-autonomous-rides-on-uber-with-avride-95b66987213b	Rides and autonomous miles with a safety operator in the driver's seat.
31	California DMV, Statement on Cruise LLC suspension, Oct. 24, 2023. https://www.dmv.ca.gov/portal/news-and-media/dmv-statement-on-cruise-llc/	Suspension of Cruise deployment and driverless testing permits.
32	General Motors, Form 10-K for 2025. https://www.sec.gov/Archives/edgar/data/1467858/000146785826000013/gm-20251231.htm	Cruise robotaxi operations wound down.
33	Baidu, Q2 2026 results, Form 6-K Exhibit 99.1, Aug. 18, 2026. https://www.sec.gov/Archives/edgar/data/1329099/000119312526355431/d112854dex991.htm	Apollo Go: 28-city footprint; 350M+ autonomous km incl. 240M+ fully driverless km.
34	Baidu, Q1 2026 results, Form 6-K Exhibit 99.1, May 18, 2026. https://www.sec.gov/Archives/edgar/data/1329099/000119312526228123/d156481dex991.htm	3.2M fully driverless operational rides; weekly peak above 350,000 in March.
35	WeRide, interim report for the six months ended June 30, 2026, Form 6-K Exhibit 99.1. https://www.sec.gov/Archives/edgar/data/1867729/000110465926107261/wrd-20260914xex99d1.htm	H1 revenue RMB345.9M; growth from L4 and L2++/L3; no robotaxi-only revenue.
36	Pony AI, Second Quarter 2026 Financial Results, Aug. 18, 2026. https://ir.pony.ai/news-releases/news-release-details/pony-ai-inc-reports-second-quarter-2026-financial-results-total	Revenue by segment; 1,975 robotaxis; consolidated margin; joint-deployment vehicle sales; Mawan port trucks.
37	WeRide, Q2 2026 results, Aug. 12, 2026. https://ir.weride.ai/node/9276/html	~3,400 L4 vehicles incl. 1,800+ robotaxis; 21+ daily rides per vehicle; revenue.
38	Aurora Innovation, Second Quarter 2026 Shareholder Letter, Form 8-K Exhibit 99.1, July 29, 2026. https://ir.aurora.tech/sec-filings/all-sec-filings/content/0001828108-26-000075/aurora26q2shareholderlet.htm	~440,000 driverless miles; 6M+ commercial miles; Q2 financials; guidance; Detmar route; Roush; Volvo VAS 300-truck expectation.
39	Aurora Innovation, Form 8-K, Item 7.01 (furnished), Sept. 23, 2026. https://www.sec.gov/Archives/edgar/data/1828108/000182810826000082/aur-20260923.htm	Furnished under Item 7.01; the filing states it is not deemed filed under Section 18. Exhibits 99.1 and 99.2.
40	Aurora Innovation, Analyst and Investor Day release, Exhibit 99.1, Sept. 23, 2026. https://www.sec.gov/Archives/edgar/data/1828108/000182810826000082/businesswire-aurora2026ana.htm	>500,000 driverless miles; >225,000 annualized miles per truck for selected customers; Hirschbach non-binding MOU; 2030 target.
41	Aurora Innovation, Form 10-Q for the quarter ended June 30, 2026. https://ir.aurora.tech/sec-filings/all-sec-filings/content/0001828108-26-000077/0001828108-26-000077.pdf	At-the-market issuance of 30M shares for \$215M net.

Source Register, Continued

#	Document	Use in this thesis
42	Aurora, Continental and NVIDIA partner to deploy driverless trucks at scale, Jan. 6, 2025 (release copy hosted by Nasdaq). https://www.nasdaq.com/press-release/aurora-continental-and-nvidia-partner-deploy-driverless-trucks-scale-2025-01-06	Dual NVIDIA DRIVE Thor with DriveOS for Aurora's primary computer; Continental (now AUMOVIO) hardware and independent fallback system; production planned 2027.
43	Aurora, Your questions about our latest driverless launch, answered, July 22, 2026. https://aurora.tech/newsroom/your-questions-about-our-latest-driverless-launch-answered	Driver's seat empty; roadside assistance staff may ride in the rear seat on some trips.
44	Kodiak AI, Second Quarter 2026 Results, Aug. 6, 2026. https://kodiakrobotics.gcs-web.com/news-releases/news-release-details/kodiak-ai-reports-second-quarter-2026-results-and-advances	35 customer-owned driverless trucks; 40,000+ paid driverless hours; loads and tons; financial statements; 91% readiness in July.
45	Kodiak AI, readiness measure reaches 96%, Oct. 6, 2026 (GlobeNewswire release, Finviz copy). https://finviz.com/news/399316/kodiak-ai-on-track-for-year-end-driverless-long-haul-launch-as-autonomy-readiness-measure-jumps-to-96	93% end-August, 96% end-September; measure is the share of safety-case claims and evidence materially complete.
46	Kodiak AI, Atlas driverless Permian expansion, July 31, 2026. https://kodiak.ai/news/atlas-driverless-permian-expansion	28 trucks at Mar. 31; target 100 by mid-2027; public roads planned early 2027.
47	FreightWaves, Kodiak taps IKEA to launch driverless freight on I-45, Sept. 29, 2026 (secondary report of a Kodiak post). https://www.freightwaves.com/?p=581923	IKEA Supply as launch shipper; 219-mile I-45 driverless leg planned; safety observer still aboard.
48	Gatik, company site. https://www.gatik.ai/	Daily driverless freight networks; more than \$600M contracted revenue, as cited by Gatik.
49	Waabi, Volvo and Waabi kick off customer operations in Texas, starting with Warp, Oct. 5, 2026. https://www.waabi.ai/insights/volvo-and-waabi-kick-off-customer-operations-in-texas-starting-with-warp	Waabi Driver on Volvo VNL Autonomous; Warp freight on Dallas–Houston; observer in the driver's seat.
50	Daimler Truck North America, Daimler Truck delivers Gen5 Cascadia to Torc, Apr. 16, 2025. https://northamerica.daimlertruck.com/fileadmin/user_upload/newsroom/2025/16_04_2025/Daimler-Truck-delivers-Gen5-Cascadia-to-Torc.pdf	Production-intent autonomy hardware; test-track driver-out runs in 2024; U.S. Level 4 entry aimed for 2027.
51	May Mobility, launches first driverless transit service, Dec. 18, 2023. https://maymobility.com/posts/may-mobility-launches-first-driverless-transit-service/	Rider-only transit with Via in Sun City, Arizona, for select Early Riders, free of charge.
52	California DMV, new autonomous vehicle regulations, Apr. 28, 2026. https://www.dmv.ca.gov/portal/news-and-media/new-autonomous-vehicle-regulations-strengthen-oversight-and-enforcement-authorize-trucks-and-transit/	Heavy-duty rules, mileage phases, 30-second response.
53	Texas DMV, commercial automated vehicle authorization bulletin, June 2, 2026. https://content.govdelivery.com/accounts/TXDMV/bulletins/419ec36	Active authorization required from May 28, 2026 (SB 2807).

PRIMARY SOURCES • CONTINUED

Source Register, Continued

#	Document	Use in this thesis
54	Teamsters, Teamsters California sues DMV, Aug. 5, 2026. https://teamster.org/2026/08/teamsters-california-sues-dmv-to-protect-public-from-driverless-truck-dangers/	Suit seeking repeal of heavy-duty AV rules; allegations.
55	Federal Highway Administration, Highway Statistics 2024, Table VM-1 (updated Feb. 2026). https://www.fhwa.dot.gov/policyinformation/statistics/2024/vm1.cfm	192,520M combination-truck miles; 3,482,896 registered combination trucks; 2,924,107M light-duty miles.
56	U.S. Bureau of Labor Statistics, CPI, September 2026, Oct. 14, 2026. https://www.bls.gov/news.release/archives/cpi_10142026.htm	Unadjusted 12-month CPI changes used on page 18.
57	BLS, PPI, September 2026, Oct. 15, 2026. https://www.bls.gov/news.release/archives/ppi_10152026.htm	Truck freight and transport-warehousing PPI (preliminary).
58	U.S. Energy Information Administration, Gasoline and Diesel Fuel Update, Oct. 20, 2026. https://www.eia.gov/petroleum/gasdiesel/	Retail on-highway diesel, week of Oct. 19: U.S. \$6.276, California \$8.242.
59	Bureau of Transportation Statistics, Freight TSI, August 2026, Oct. 14, 2026. https://www.bts.gov/node/244746	134.4; -0.4% month on month; -3.0% year on year; seasonally adjusted.
60	American Transportation Research Institute, Operational Costs of Trucking, 2026 update (2025 data). https://truckingresearch.org/about-atr/atr-research/operational-costs-of-trucking/	\$2.336 per mile marginal cost, +3.4%; \$1.854 excluding fuel.

Records checked without a finding

Item sought	Records checked	Result through Oct. 22, 2026
Intervention frequency	Markey report and company responses; CPUC stoppage files	Withheld by all seven companies queried; California contents redacted
Manual retrievals	CPUC Stoppage-Fleet file	Redacted
Software build in the Jan. 12 event	NTSB preliminary; recall report	Not stated
Active fleet hours	CPUC monthly and trip files	Not in the published template
Fleet insurer and premiums	Waymo safety hub; operator disclosures reviewed	Not located; Swiss Re appears only as a claims-research collaborator

DISCLOSURES

Bottom Line and Investment-Risk Disclosure

Bottom line

The catalyst is partly realized. Commercially useful, repeatable driver-out service is established in U.S. surface-street ride-hail, where the Waymo Driver carried 4.22 million completed California trips in one quarter, and in Permian sand hauling, where 35 Kodiak-equipped Atlas trucks run driverless. Safety has independent support only in Waymo's historic cities for 2021–24, and highway freight and Chinese ride-hail are emerging under company definitions.

Economic viability is unresolved in every domain. None of the disclosures I reviewed isolates driver-out profit and loss, the seven companies queried by Senator Markey withheld intervention frequency, and no record reviewed establishes driver-out contribution in any freight domain. The record shows a working technology in narrow domains that has yet to show it pays for itself.

Next measurement

The CPUC third-quarter 2026 Waymo filing, if published by mid-November, and third-quarter results from Aurora and Kodiak. I will record a dated tracking note against this baseline.

What would move my reading

Branch	Signals that would strengthen it	Signals that would weaken it
Passenger	Market or segment contribution disclosed after full costs; a second operator with an independent safety analysis	Trips falling as promotions end; permit suspension after a severe crash
Freight	Lane or DaaS gross profit disclosed; binding conversion of truck MOUs	Driver-out share of loads stalling; hardware cost or life short of targets
Shared layer	Intervention or retrieval counts disclosed and falling per trip	An NTSB finding that remote advice failed systemically

What the third quarter can and cannot settle

Third-quarter filings can extend the volume and safety record, although they cannot settle economic viability unless an operator discloses driver-out contribution or a carrier discloses cost per loaded mile.

Grading and observation

Expected significance is set at ★★☆☆ for breadth against U.S. commercial road transport. No outcome grade or realized Depth is issued. Passenger and freight remain independent observation blocks, each reviewed as dated evidence appears without a fixed terminal.

Investment-risk disclosure. Independent research for informational and educational purposes. Not personalized investment advice, an offer, a solicitation, a recommendation, a rating, a price target, a stock prediction, or an expected-security-return analysis. Investing involves risk, including possible loss of principal. Figures are drawn from the primary sources listed in the source register and are current as of the evidence date printed on page 1. Company-defined non-GAAP measures are not a substitute for results reported under GAAP.