

REMOTE BACK SEAT OPERATORS:

REVEALING THE AUTONOMOUS VEHICLE INDUSTRY'S RELIANCE ON HUMAN REMOTE ASSISTANCE OPERATORS



Executive Summary

In February 2026, Senator Edward J. Markey launched an investigation into the use of Remote Assistance Operators (RAOs) by autonomous vehicle (AV) companies. Largely unknown to the public before this investigation, AV companies still rely on human workers — located remotely offsite from the vehicle — to help their self-driving cars navigate difficult driving situations. The use of RAOs raises serious safety, privacy, and national security concerns as well as questions about the true level of autonomy that AV companies have achieved.

To better understand the role, qualifications, and standards around the use of RAOs, Senator Markey wrote oversight letters to seven major AV companies — Aurora, May Mobility, Motional, Nuro, Tesla, Waymo, and Zoox — requesting detailed information about their RAOs. This report — based on responses to Senator Markey’s letters — is the first detailed examination of the role that RAOs play in the AV industry. The top findings include:

1. Every AV company refused to disclose how frequently their RAOs intervene to help their self-driving cars.
2. Waymo is the only AV company that uses overseas RAOs.
3. Waymo is the only AV company in which a substantial share of its RAO workforce does not hold a U.S. driver’s license.
4. Latency between AVs and RAOs varied across companies, indicating that companies are making their own determinations about the latency threshold that constitutes a safety risk.
5. Although every company claimed that its autonomous driving systems would ignore dangerous advice from RAOs, a recent investigation by the National Transportation Safety Board (NTSB) into an incident involving a Waymo AV casts doubt on this claim.

Background and Methodology

Generally unknown to the public, every AV operator relies on human workers to help their self-driving cars navigate difficult driving scenarios. Although the exact RAO role and performance vary by manufacturer, RAOs intervene when an AV confronts a driving condition or situation in which the system either cannot proceed or is unsure how to proceed. RAOs generally do not control the steering, braking, or acceleration of the vehicle. Instead, they provide guidance, approvals, or clarifications for how the autonomous driving system — which is responsible for driving the vehicle — should handle a difficult or confusing driving situation or road condition. RAOs therefore play an important and little-understood role in safe AV operation.

Importantly, the appropriate standards for RAO operations should vary based on the level of autonomy a company has achieved. A fully driverless vehicle with no safety driver present demands far more rigorous remote assistance safeguards than a vehicle that still operates with a human backup behind the wheel.

On February 3, 2026, Senator Markey wrote to seven major AV operators in the United States requesting detailed information about their remote assistance operations. Those companies were:

- Aurora
- May Mobility
- Motional
- Nuro
- Tesla
- Waymo
- Zoox

The letter included 14 questions about each company's remote assistance operation, including questions on the frequency of human intervention, location of their operations, qualifications for RAOs, latency of connection between vehicles and RAOs, and cybersecurity standards. Senator Markey's office also sent follow-up inquiries to the AV companies requesting additional information on each of these topics. The companies' answers inform this report.

Findings

1. Every AV company refused to disclose how frequently RAOs intervene to help their self-driving cars.

AV companies promise that their self-driving technology can reduce the number of road fatalities by eliminating human error, but the use of RAOs raises serious questions about the level of autonomy that these companies have achieved. To the extent that RAOs are frequently helping AVs navigate the roads — even if RAOs aren't technically teleoperating the vehicle, as nearly every AV company made clear — these self-driving cars still rely heavily on human intervention, undermining the AV companies' claims about autonomy. In any event, given the bold statements made by many AV companies about the safety of their vehicles, the public deserves transparency about how frequently AVs rely on human guidance to operate.

Unfortunately, every AV company refused to disclose how often their AVs require assistance from RAOs — hiding key information from the public about their AVs' true level of autonomy. This information is critical for lawmakers, regulators, and the public to understand the potential safety risks with AVs; all seven companies' refusal to disclose this data raises serious questions about their commitment to operating transparently and rolling out this technology in a responsible manner.

Tesla's nonresponse on this question is especially concerning for two reasons. First, Tesla stated that its RAOs can take control of the vehicle remotely and drive it at a speed of up to 10 miles per hour.ⁱ That Tesla's RAOs are permitted to teleoperate the vehicle makes it even more important that the company is transparent about the frequency of RAO interventions. Second, given Tesla's history of misleading consumers about the true level of autonomy in its vehicles through brand names such as "Full Self-Driving" — which, despite the name, still requires constant human supervisionⁱⁱ — the public may be rightfully skeptical that Tesla's robotaxis are truly autonomous and are not quietly relying on RAOs or teleoperators. Given the safety risks with deploying AVs on public roads, it is critical that Tesla — and all AV manufacturers — operate with the utmost level of transparency.

2. Waymo is the only AV company that uses RAOs overseas.

At a hearing in February 2026 before the Senate Committee on Commerce, Science, and Transportation, Waymo revealed that it has RAOs located in the Philippines.ⁱⁱⁱ This investigation further uncovered that Waymo is the *only* major AV operator engaged in this risky practice.^{iv}

Overseas remote assistance introduces serious safety, security, and privacy risks.^v Greater physical distance between vehicles and RAOs introduces higher risks for communication lags or disruptions, which can have serious consequences for an RAO's ability to provide timely and safe guidance to a vehicle.^{vi} Although Waymo argued that physical distance is less important than network infrastructure, its own latency data — as reported in the fourth finding — shows its overseas RAOs experience significantly higher latency than domestic ones, undermining this claim.^{vii} Overseas remote assistance also introduces unnecessary cybersecurity risks. Remote assistance operations outside the United States may be subject to foreign laws and standards rather than U.S. cybersecurity and data-protection requirements. In short, overseas remote

assistance introduces unnecessary risks to Waymo's operation — risks that no other AV company is taking.

3. *Waymo is the only AV company in which a substantial share of its RAO workforce does not hold a U.S. driver's license.*

Given the critical role that RAOs play in the safe operation of AVs, RAOs must have experience with and knowledge of the rules on U.S. roads, typically validated through the issuance of a driver's license, including passage of an exam covering the rules of the road. A driver's license is a foundational safety regulation that ensures anyone legally operating a vehicle on public roads has met a minimum standard of competence. By contrast, allowing RAOs without a U.S. driver's license to influence the driving behavior of vehicles introduces an unprecedented safety risk onto public roads.

Yet Waymo is taking that risk by failing to require remote operators to hold a U.S. driver's license. According to Waymo, its overseas RAOs — which make up half of Waymo's total RAO workforce — are required to hold a local driver's license, not a U.S. driver's license.^{viii} No other company has a similar policy.^{ix} A driver's license in a foreign location is not a substitute for passing a U.S. driver's license exam, as the rules of the road will almost certainly vary by location. RAOs meaningfully influence the behavior of AVs on public roads and should therefore generally meet the most basic road safety requirement: holding a U.S. driver's license.

4. *Latency between vehicles and RAOs varied significantly across companies.*

When an AV suddenly finds itself in a dangerous situation and requires guidance from an RAO, every second — or millisecond — counts. Dangerous driving situations can arise in only tenths of a second, making it vital that RAOs give up-to-date guidance. If the time it takes for an AV and RAO to communicate with each other — a concept known as latency — is too slow, the RAO could provide incorrect or outdated information, potentially leaving the AV in an uncertain or dangerous situation. Research suggests that a latency of only 300 milliseconds can make remote *driving* dangerous.^x No research or federal standard has identified the latency that could make remote *assistance* dangerous. Given these safety risks, AV companies should have clear, evidence-based metrics to ensure that latency will not negatively impact or otherwise interfere with an RAO's ability to provide accurate guidance to an AV.

Yet, based on company responses, average latency among the AV companies varied significantly. Companies were asked to provide both average and worst-case latency estimates; some companies, including Aurora and Tesla, provided neither, while others provided only the average latency estimate. The sheer range of the average one-way latency figures — from 100 milliseconds to at least 300 milliseconds — exposes serious risks with the companies' RAO operations. Without any clear rules for permissible latency, each company appears to have effectively established its own threshold for safety. Waymo's latency figure for its overseas RAOs (250 milliseconds) was notably two-thirds higher than the latency for its domestic RAOs (150 milliseconds).^{xi} May Mobility had one of the fastest one-way latency figures (100-140 milliseconds) but its worst-case latency figure (500 milliseconds) may be too slow for an RAO to provide accurate, useful guidance to an AV in a dangerous driving situation.^{xii} The same may be true for Zoox's worst-case latency of 333 milliseconds.^{xiii} Nuro's one-way latency was 200

milliseconds^{xiv} while Motional’s latency varied significantly by direction, with information traveling much slower from the vehicle to the RAO (300 milliseconds) than in the reverse direction (80 milliseconds).^{xv} Moreover, acceptable latency may vary based on whether the vehicle is typically operating with in-person human supervision, as is the case for companies such as Motional. The wide variance in latency figures, and the refusal of some companies to provide complete information, raise serious questions about the industry’s commitment to safety.

Notably, several companies implicitly acknowledged the risks that high latency could pose to vehicle safety. These companies explained that their AVs are often designed to meet a “minimal risk condition” — typically by pulling off to the side of the road — if they are unable to communicate with their RAO in a timely manner.^{xvi} Such a situation could arise due to a network interruption or an unacceptably high level of communication delay between the AV and RAO. In those cases, the AV is effectively designed to cease operating until a stable connection can be re-established, underscoring that the AV is reliant upon timely information from an RAO to navigate a dangerous or uncertain driving situation. This concession also assumes that the AV can pull off the road and reach a “minimal risk condition” without guidance from the RAO. To the extent that the RAO guidance is necessary to avoid a life-threatening situation, high or low latency could be the difference between a tragic outcome and a safe maneuver.

5. Every company claimed that their autonomous driving systems would ignore dangerous advice from RAOs.

Every company downplayed the importance of RAOs, providing assurance that autonomous technology can perform all driving tasks safely without remote assistance. The companies also uniformly provided assurance that, even if an RAO were to provide dangerous or outdated guidance to an AV, the automated driving system would ignore the advice and make the safest decision. For example, in its response, Zoox stated: “[E]ven if a tactician’s visual or audio information is stale, the robotaxi would not act upon any resulting guidance that conflicts with reality or presents a safety risk.”^{xvii} Similarly, Waymo said: “The ADS can also reject RA suggestions if it deems it appropriate.”^{xviii}

Unfortunately, a recent incident involving a Waymo AV casts doubt on this assurance. A recent NTSB investigation found that, after relying on incorrect information from an RAO, a Waymo vehicle passed a school bus with an extended stop sign — an illegal maneuver.^{xix} This incident raises serious questions about whether the RAO held a U.S. driver’s license, whether the RAO received outdated information from the AV due to a high-latency connection, and why the AV nevertheless followed the unsafe guidance. This event further demonstrates that RAOs command significant power over AVs and highlights that policymakers must ensure that remote assistance improves, not imperils, road safety.

Conclusion

This report has revealed a stunning lack of transparency from the AV companies around their use of RAOs to help guide their AVs. The investigation exposed a patchwork of safety practices across the industry, with significant variation in operator qualifications, response times, and overseas staffing, all without any federal standards governing these operations. The findings suggest that policymakers need to act to ensure that remote assistance operations meet clear safety benchmarks before these companies scale further onto public roads.

ⁱ Letter from Karen Steakley, Director, Public Policy and Business Development, Tesla, to Senator Edward J. Markey (Mar. 26, 2026) (hereinafter “Tesla Response”).

ⁱⁱ Letter from Senators Richard Blumenthal and Edward J. Markey, to Lina Khan, Chair of the Federal Trade Commission (Aug. 18, 2021), <https://www.markey.senate.gov/news/press-releases/markey-and-blumenthal-call-for-ftc-investigation-into-teslas-misleading-advertising-of-driving-automation-systems>.

ⁱⁱⁱ *Hit the Road, Mac: The Future of Self-Driving Cars*, 119th Cong. (2026) (statement of Mauricio Pena, Chief Safety Officer, Waymo).

^{iv} Letter from Ryan McNamara, Vice President and Global Head of Operations, Waymo, to Senator Edward J. Markey (Feb. 17, 2026) (hereinafter “Waymo Response”).

^v Press Release, Office of Senator Edward J. Markey, Senator Markey Opens Investigation into Autonomous Vehicle Companies’ Use of Remote Human Operators (Feb. 3, 2026), <https://www.markey.senate.gov/news/press-releases/senator-markey-opens-investigation-into-autonomous-vehicle-companies-use-of-remote-human-operators>.

^{vi} Volico, *Network Latency: Root Causes and Solutions* (Apr. 8, 2025), <https://www.volico.com/network-latency-root-causes-and-solutions/>.

^{vii} Waymo Response, *supra* note iv.

^{viii} *Id.*

^{ix} The only other company with an RAO without a U.S. driver’s license was Motional. In that case, all Motional RAOs hold U.S. driver’s licenses, except for a limited number who could not obtain a driver’s license due to a physical disability. Correspondence between Motional staff and staff from the Office of Senator Edward J. Markey (Mar. 18, 2026). This is markedly different from Waymo’s policy.

^x Stefan Neumeier et al, *Teleoperation: the holy grail to solve problems of automated driving? Sure, but latency matters*, 11th International Conference on Automotive User Interfaces and Interactive Vehicular Applications (Sept. 2019), https://www.researchgate.net/publication/335941077_Teleoperation_The_Holy_Grail_to_Solve_Problems_of_Automated_Driving_Sure_but_Latency_Matters.

^{xi} Waymo Response, *supra* note iv.

^{xii} Correspondence between May Mobility staff and staff from the Office of Senator Edward J. Markey (Mar. 18, 2026).

^{xiii} Correspondence between Zoox staff and staff from the Office of Senator Edward J. Markey (Mar. 29, 2026).

^{xiv} Correspondence between Nuro staff and staff from the Office of Senator Edward J. Markey (Mar. 18, 2026).

^{xv} Correspondence between Motional staff and staff from the Office of Senator Edward J. Markey (Mar. 27, 2026).

^{xvi} Waymo Response, *supra* note iv.

^{xvii} Letter from Christopher Nalevanko, General Counsel, Zoox, to Senator Edward J. Markey (Mar. 3, 2026).

^{xviii} Waymo Response, *supra* note iv.

^{xix} National Transportation Safety Board, *Automated Driving System-Equipped Vehicle Passed School Bus Loading Student Passengers* (Mar. 3, 2026), <https://www.nts.gov/investigations/Pages/HWY26FH007.aspx>.