

INNOVATION FOR TRANSPORTATION SYSTEMS

Russ Buchholz

NORTH
Dakota
Be Legendary.

Transportation

Question 1

How many Commercial Driver License (CDL) Drivers are licensed in North Dakota?

49,591

Question 2

Of the 49,591 Commercial Driver License (CDL) Drivers in North Dakota

How many are age 50 or over?

30,046

Question 3

How many States have passed laws enabling and regulating autonomous vehicle deployments?

29 States have passed laws enabling and regulating autonomous vehicle deployments, further validating their legal ability to operate autonomous trucks complying with applicable regulations.

29 states—Alabama, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maine, Michigan, Mississippi, Nebraska, New York, Nevada, North Carolina, **North Dakota**, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Vermont, Washington and Wisconsin —and Washington D.C. have enacted legislation related to autonomous vehicles.

Governors in Arizona, Delaware, Hawaii, Idaho, Illinois, Maine, Massachusetts, **Minnesota**, Ohio, Washington and Wisconsin have issued executive orders related to autonomous vehicles.

Background / History

Northwest Passage



Vision

The vision of the North/West Passage Corridor is to focus on developing effective methods for sharing, coordinating, and integrating traveler information, operational activities, and emerging technologies across state and provincial borders. The vision provides a framework to guide the states' future projects in the corridor.

Focus Areas

The focus areas of North/West Passage have been modified based on changes to the transportation environment and the focus of projects through the years. Currently the North/West Passage is focusing on the following six different areas:

- Traveler Information
- Maintenance and Operations
- Planning and Program Management
- Freight
- Staffing and Resources
- Integrating Emerging Transportation Technologies

Connected Vehicle / Autonomous Vehicle

Connected

Connected Vehicle (CV) technologies are equipment, applications, or systems that use vehicle to everything (V2X) communications to address safety, system efficiency, or mobility on our roadways.

Autonomous

Self-driving vehicles or transport systems that move without the intervention of a human driver.

There are several critical technologies behind safe and efficient autonomous-vehicle operation—artificial intelligence (AI), safety and security software, cameras, network infrastructure, and sensor technologies: radar and LiDAR, or 3D laser scanning.

Platooning / Legislation

Truck platooning is a technique that involves linking multiple commercial trucks together in a convoy to travel in close proximity. The trucks are connected by a computer system that allows them to coordinate their speed, acceleration, and braking.

Truck platooning can offer several benefits, including:

Fuel economy

- Platooning can improve fuel economy by reducing air drag. According to the National Renewable Energy Laboratory (NREL), the lead vehicle in a platoon can save up to 5.3% on fuel, while the trailing truck can save up to 9.7%.

Safety

- Platooning can reduce the risk of crashes by using collision avoidance systems and vehicle-to-vehicle communication.

Traffic flow

- Platooning can increase traffic flow on highways, particularly along freight corridors (i.e. North/West Passage).

Platooning



NDCC-39-10-18. **Following too closely.**

4. This section does not apply to the operation of a non-lead vehicle in a platoon.

5. As used in this section and section 39-10-74, "platoon" means a group of motor vehicles using vehicle-to-vehicle communications to travel in a unified manner at close following distances on a multilane, limited-access, divided highway.

HB 1199 effective August 1, 2019

Platooning

ND Century Code

NDCC 39-10-74. Motor vehicle platoons

1. The department, in coordination with the state highway patrol superintendent, shall develop an operational plan that provides guidelines for operating a platoon. The plan must include operational information that must be provided by a platoon technology provider or commercial motor vehicle operator. The department may restrict platooning operations in accordance with the guidelines or the operational information provided in the plan.
2. A platoon may not operate unless the platoon technology provider or the commercial motor vehicle operator files an operational plan with the department and the plan is approved for general platoon operations. If the department does not approve the plan, the department shall inform the platoon technology provider or commercial motor vehicle operator of the reason for the disapproval and provide guidance on how to resubmit the plan to obtain approval.
3. A person operating a motor vehicle in a platoon without an approved plan must be assessed a fee of one hundred dollars.
4. A person operating a motor vehicle in violation of the guidelines in an operational plan must be assessed a fee of one hundred dollars

Platooning

NDDOT Autonomous Attenuator Truck Acquired in the Fall of 2020



The goal is to eliminate the driver from serious injury while at the job site.

The pilot crash-protection project was made possible by a \$241,687 grant from the Federal Highway Administration.



Platooning

Minn-Dak Farmers Cooperative



- Minn-Dak Farmers Cooperative (Sugar Beet Producer) – approved in the fall of 2022 – Operational a GO
- Sugar beet Stockpiles (2 locations – Galchutt and Tyler) to the plant (N Wahpeton)
- Operational for 2023 and 2024's fall's harvest – will keep "safety driver" in trailing vehicle until authorized by NDDOT/NDHP

Minn-Dak Farmers Cooperative

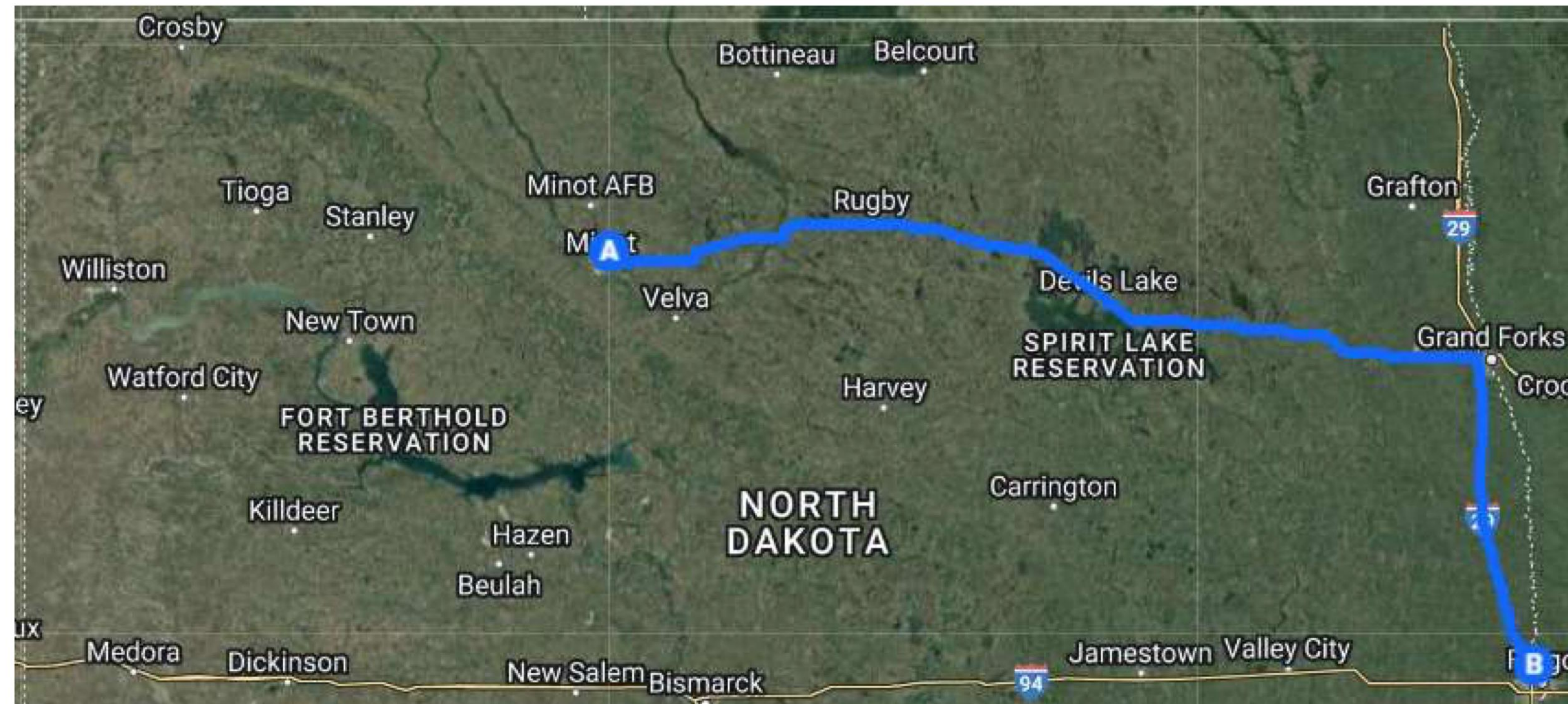


CHS[®] (Cenex Harvest States)

Restrictive Criteria:

- A driver will be present in each vehicle at all times.
- Operation is restricted to 4 lane roads.
- Operating Distance Range:
 - Min: 50 feet (on - off ramps)
 - Max: 600 feet
- Average: 200 feet
- System is capable of handling 1,600 feet distance between units.
- Frequency – Monday thru Friday (every other day)
 - 1 trip per operative day

Point A – Minot, ND to Point B – Fargo, ND



Connected Vehicle / Autonomous Vehicle

Autonomous

The Society of Automotive Engineers (SAE) defines 6 levels of driving automation ranging from 0 (fully manual) to 5 (fully autonomous). These levels have been adopted by the U.S. Department of Transportation.

Connected Vehicle / Autonomous Vehicle

Autonomous

- Level 0 (No Driving Automation)
- Level 1 (Driver Assistance)
- Level 2 (Partial Driving Automation)
- Level 3 (Conditional Driving Automation)
- Level 4 (High Driving Automation)
- Level 5 (Full Driving Automation) – est 2035

Connected Vehicle / Autonomous Vehicle

Mercedes-Benz Is the First Marque Certified for Level 3 Autonomous Driving in California

Autonomous

The states of California and Nevada have given Mercedes approval to start selling vehicles with its "Drive Pilot" system.

The **SAE Level 3 advanced driver-assistance system (ADAS)** can't fully operate a vehicle on its own, but it does allow the person behind the wheel to legally take their eyes off the road, though they must be available to resume control if needed. The technology can only be used on certain roads during daylight hours and not at speeds exceeding 40 mph.

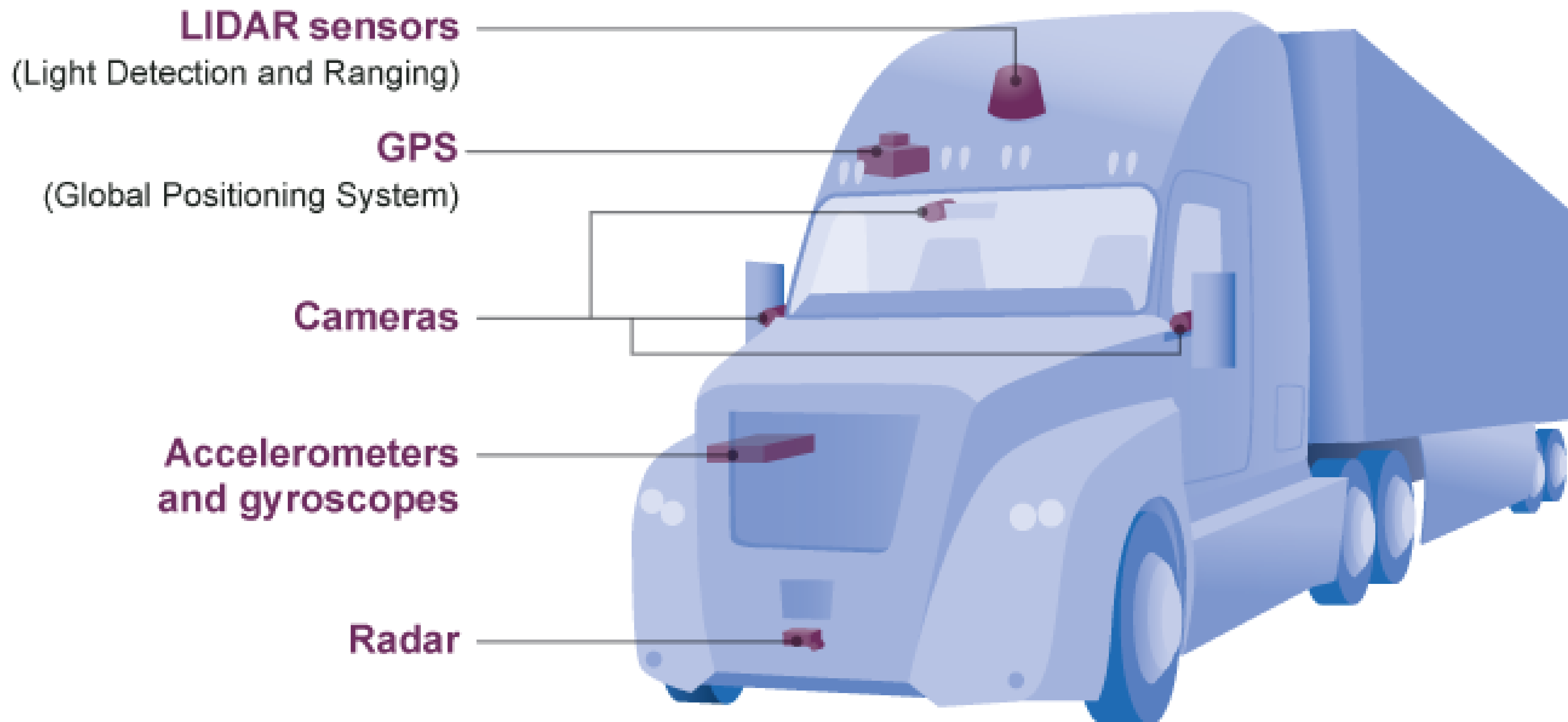
<https://www.extremetech.com/cars/mercedes-becomes-first-automaker-to-secure-level-3-automation-approval>

September 27, 2023

Infrastructure / Sensors

Autonomous Truck Operations

Examples of Technologies for Self-Driving Trucks



Source: GAO analysis of interviews with technology developers. | GAO-19-161

Autonomous Truck Operations

Examples of Automated Vehicle Technologies for Commercial Trucks

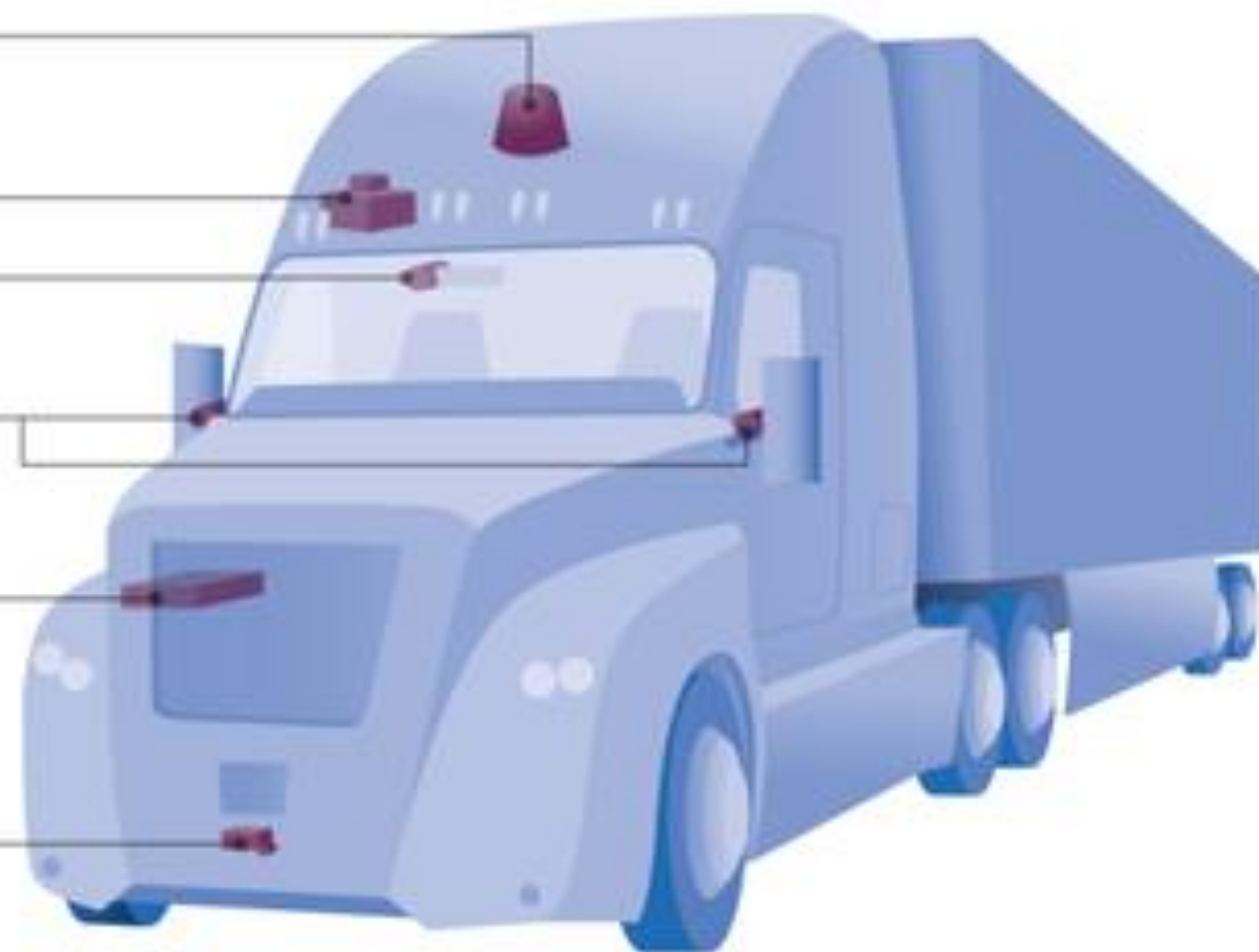
LIDAR (Light Detection and Ranging) **sensors**
Use pulses of light to measure distances

GPS (Global Positioning System)
Communicates with satellites to find truck's position and aid in navigation and timing

Cameras
Send visual information to automated systems

Accelerometers and gyroscopes
Constantly track the truck's position and help improve the accuracy of the GPS

Radar
Uses pulses of energy to detect and monitor objects



Source: GAO analysis of interviews with technology developers. | GAO-19-161

Are Highways rated for Autonomous Vehicles?

No, most highways are not currently rated for autonomous vehicles (AVs), and there is a need to improve the quality of roads to support the technology.

Here are some reasons why highways need to be improved to support AVs:

Road quality - Many highways in the US are in poor condition, with 20% of urban highways considered unacceptable. AVs struggle to navigate potholes, unclear lane markings, and poor signage.

Infrastructure readiness - According to a mobility advisory firm, 74% of consumers believe roads are not ready for AVs.

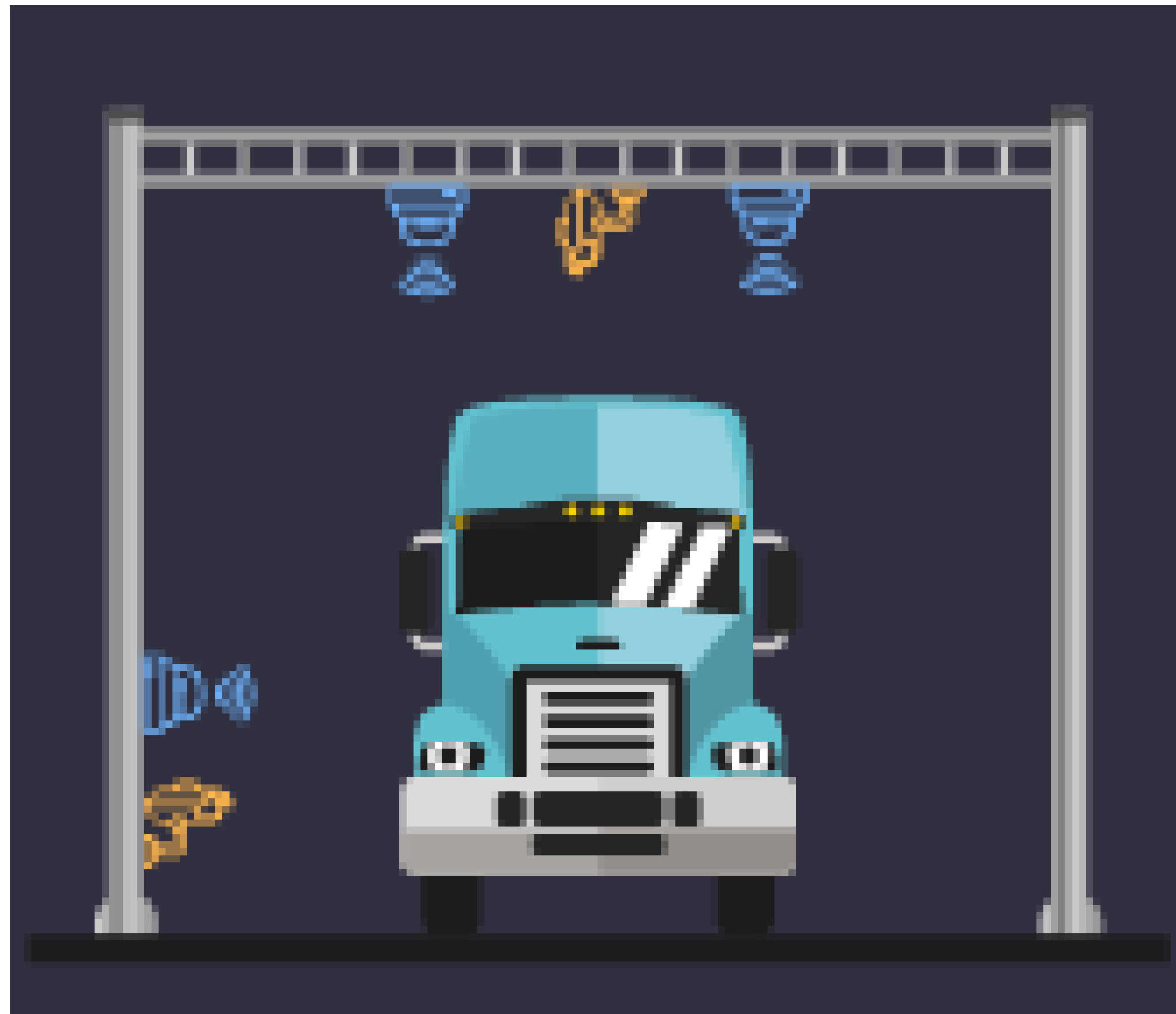
Transition - The transition to a mixed fleet of vehicles will be challenging, and roads need to be able to be "read" by cars.

The National Highway Traffic Safety Administration (NHTSA) monitors the safety of AVs through a Standing General Order that requires manufacturers and operators to report crashes. The IIHS also rates the safety of partial driving automation systems.

Oversize Vehicle Measurement System

I-29 (Mooreton Weigh Station) – LiDAR 3D Model – MM23

Minot – LiDAR Over height Detection -16th Street Bridge



Advanced Warning System

Sensors mounted capture vehicles in a single lane of travel at controlled speeds. Trucks are scanned in real-time by the sensors, which consist of three LiDAR scanners and one high-resolution camera.

The measurement data recorded to generate a 3D model for each vehicle, visualizing excessive heights, widths, and lengths. Also, the solution enables the counting of axles, axle spacing, and vehicle type.





Questions?

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- Tesla Motors CEO Elon Musk revealed a [two-seat driverless "Cybercab" and a 20-seat "Robovan"](#) at an event last night at the Warner Bros. studio in Burbank, California, anticipating production of the robotaxi starting before 2027 with a price tag for the smaller vehicle of under \$30,000.
- The Cybercab has no pedals or steering wheel, and Musk offered few details on the Robovan. Musk also announced that Tesla will begin [driverless trials in California and Texas](#) next year for the use of its Model 3 sedan and Model Y SUV as robotaxis, using an advanced version of its software.
- However, industry experts who tested a 2024 model year Tesla Model 3 running its supervised "full self-driving" software in real-world conditions said yesterday that "[it falls well short of any true autonomy](#) in the real world." Despite the name, the full self-driving feature requires [a fully attentive driver](#), according to Tesla.

Elon admitted on stage last week that "I tend to be a little optimistic with time frames."

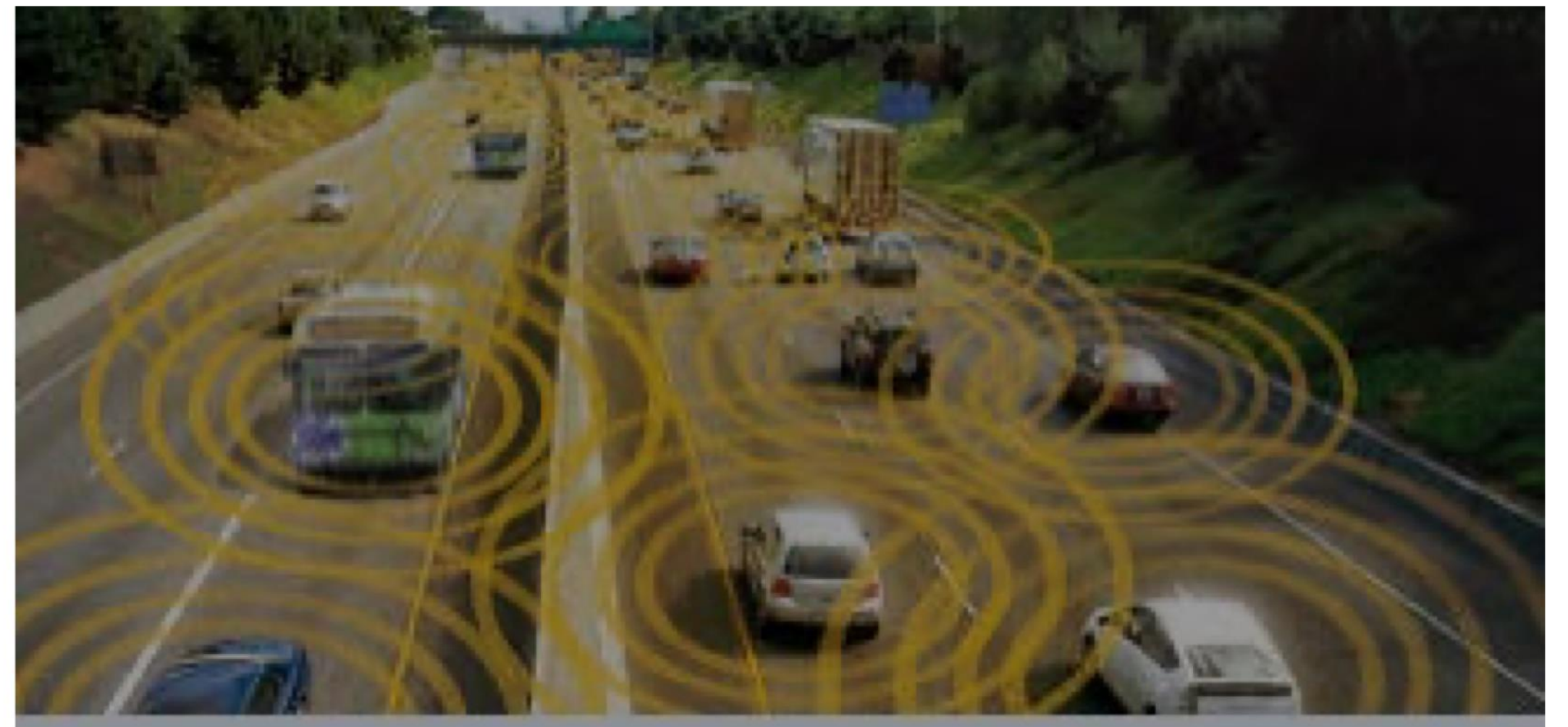
Future SMART Corridors

- A goal to adapt as transportation technology evolves is Smart Corridors. With the emergence of “connected vehicles” with access to cellular communications, internet, wi-fi and other technologies, SMART devices will allow for transportation departments to receive and disseminate information to motorists in the future.

**Future Opportunities are all proposed as Funding becomes available -Items are part of a Planning RAISE GRANT*

Meeting quarterly with Dakota Carrier Network (DCN) discussing the I-29 SMART Corridor on a possible Private-Public Partnership

<https://www.dot.nd.gov/projects/smart29/>



Future SMART Corridor Opportunities (currently designated for all of I-29)

- Additional ITS Devices
 - More DMS
 - More RWIS
 - Bridge Deck Sprayers
 - Curve Warning Systems
- Flood Monitoring
- Variable Speed
- Incident Management / Traffic Monitoring
- Ramp Metering