

Autonomous Vehicles: How Safety Paves the Road to Success



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MIT Mobility Forum
May 2024



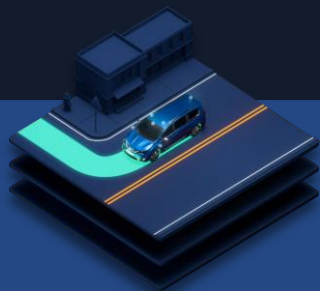
OUR MISSION

Deliver the
benefits of
self-driving
technology
safely, quickly,
and broadly

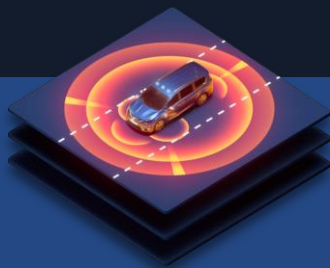


Aurora

The Aurora Driver



Self-driving software



Self-driving hardware



Data services & platform



A fully integrated self-driving stack that operates across multiple vehicle types

Best in Class OEM Partners

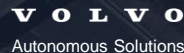


PACCAR



Industry-Leading Fleet Service Partner

Industry-Leading Logistics Companies



Uber Freight



Pioneering Hardware as a Service Partner

Deep, strategic relationships support our path to commercialization and scale in trucking



Industry pain point

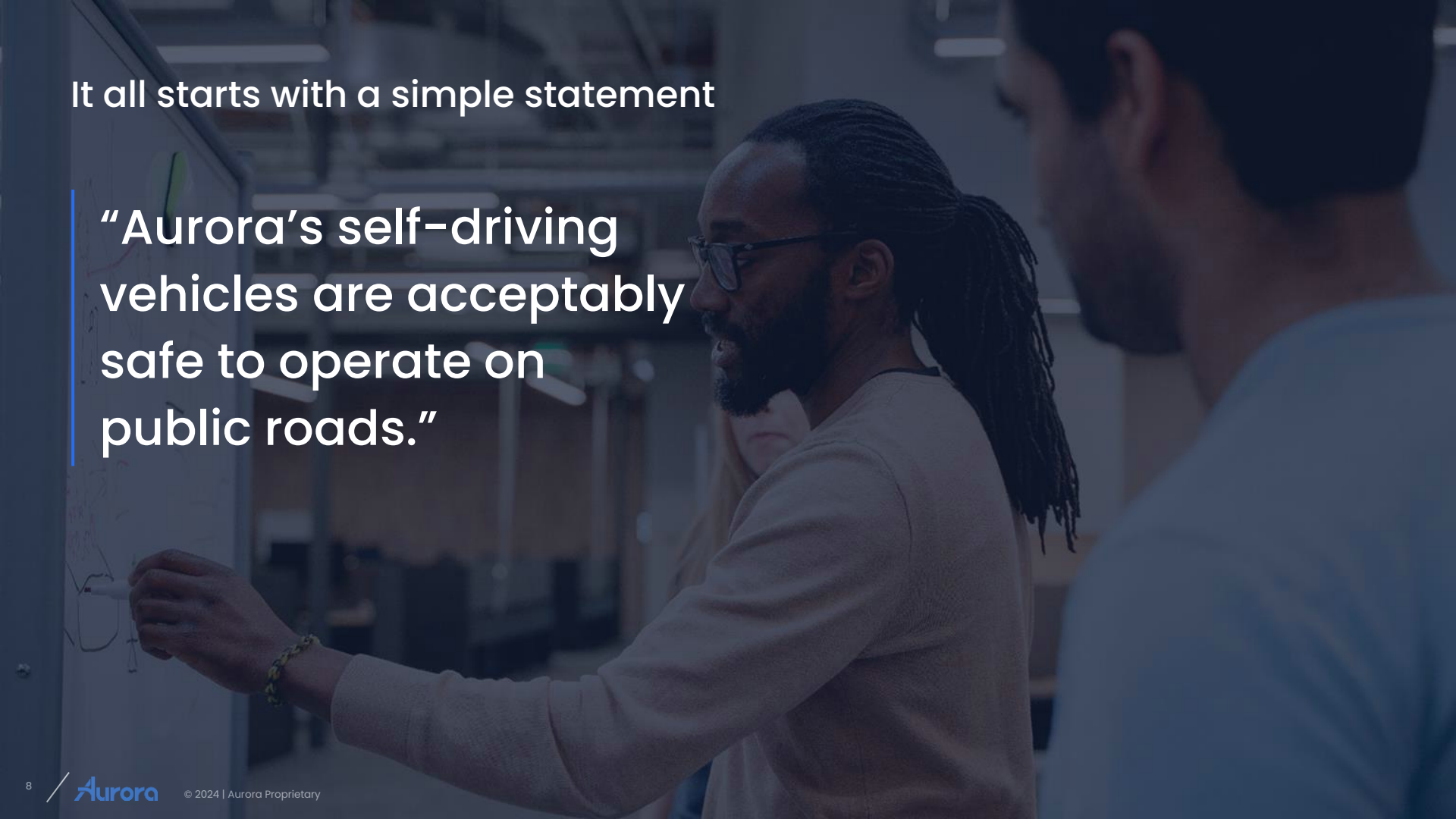
Frequency of
major collisions



The Aurora Driver will provide

Safer
operation

We're designing our autonomous trucking product to address the industry's primary pain points BUT the product needs to be safe

A man with dreadlocks and glasses is writing on a whiteboard in a meeting. He is wearing a light-colored long-sleeved shirt and a yellow beaded bracelet. Another person is partially visible in the foreground on the right, looking towards the whiteboard. The background is a blurred office or meeting room.

It all starts with a simple statement

“Aurora’s self-driving vehicles are acceptably safe to operate on public roads.”

But that statement begs
a lot of questions...

“Can the Aurora Driver detect
and respond to emergency vehicles?”

“Does Aurora have the processes in place
to identify and resolve risks to safety?”

“Can the Aurora Driver safely
navigate roads it will travel on?”

“Can the Aurora Driver safely handle
an unexpected hardware failure?”

“Is the Aurora Driver vulnerable
to misuse or abuse?”



Aurora's self-driving vehicles are acceptably safe to operate on public roads



Every question needs to be answered, with evidence

“Can the Aurora Driver safely navigate roads it will travel on?”



“Can the Aurora Driver safely handle an unexpected hardware failure?”



“Can the Aurora Driver detect and respond to emergency vehicles?”



What does evidence look like?



Validated Vehicle Capabilities



Safety Management System, Organizational Processes



Backup plans, Redundancy



Partnership with regulators, Transparency into safety metrics

V and V as an example for how safety
is defined for the Aurora Driver

Scenarios Encountered in Trucking Operations

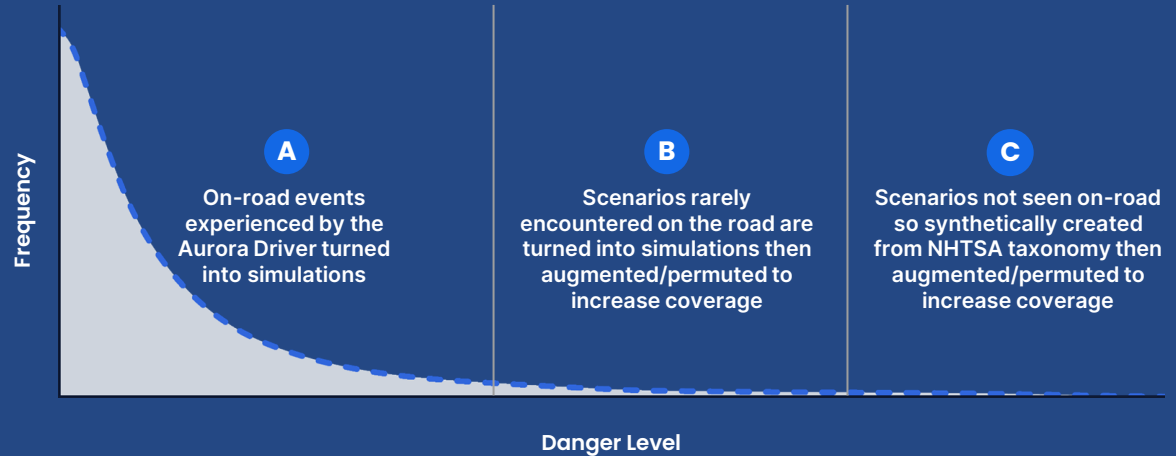
When validating a self-driving system, one of the challenges is the most dangerous scenarios on the road are also the rarest



Frequency of Encounter in Naturalistic Driving

Scenarios Encountered in Trucking Operations

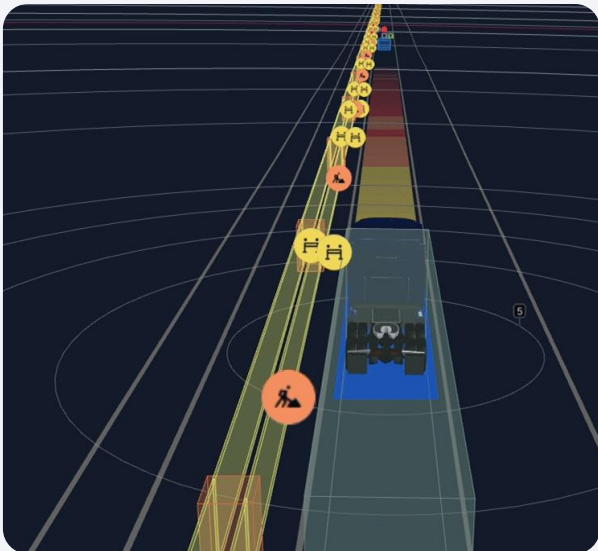
Road-based testing is not enough— Aurora's Virtual Testing Suite is designed to amplify exposure to rare events



C

We synthetically generate the rarest of events, which the Aurora Driver has not experienced on the road, from the NHTSA collision categorization and amplify them via permutation

An example of a (passing) simulation replicating a "stopped in lane" scenario



Red box: minimum expected response from the Aurora Driver

Blue truck: actual response from the Aurora Driver

Example permutations of the same scenario



Stopped vehicle in a different position



Cones on the right, moving vehicles on the left



Cones on both sides



Cones on the right, moving vehicle on the left, different road curvature

Forward Port

Forward Center

Forward Starboard



Great Tech also needs great culture
and process to truly deliver

Safety Management System

Safety Policy

How we define our commitments, accountabilities, and employee responsibilities for safety

Safety Assurance

How we maintain high-quality and effective safety risk controls and mitigations

Safety Risk Management

How we manage safety risk within the enterprise

Safety Culture

How we measure our safety culture and engage, communicate, and educate employees

Importance of Safety Culture

BUSINESS

Boeing's Safety Culture Faulted by F.A.A. in New Report

The report by a group of experts was commissioned at the behest of Congress and in response to fatal crashes involving 737 Max jets in 2018 and 2019.

By Niraj Chokshi

Regulators Are Investigating Boeing's Safety Culture Amid Complaints By Its Engineers

AUGUST 24, 2021 · 6:05 PM ET

By The Associated Press

KBIA

Investigative Report: Looking Into Callaway Nuclear Power Plant's "Safety Culture"

One employee who was not happy with how his concern was dealt with received a \$550,000 settlement after he was discriminated against for pursuing safety...

May 24, 2010

Flight Global

C-17 crash report exposes cracks in USAF safety culture

Pilot error is the US Air Force's official cause for the first fatal crash of a Boeing C-17, but the service's investigation report has also exposed lax...

Dec 17, 2010

CNN

Study: Deepwater Horizon workers were afraid to report safety issues

A confidential report on safety conditions aboard the Deepwater Horizon oil rig, conducted about one month before the rig's explosion, points to widespread...

Jul 22, 2010

NS New Scientist

Why BP's failure to mention safety culture is problem

This has surprised safety experts. "The fact that BP has failed to identify its organisational structure as a factor in the accident is itself an indication of..."

Sep 14, 2010

Autonomy Readiness Measure (ARM)
(as of mid-Jan '24)

The Autonomy Readiness Measure (ARM) illustrates the great progress we are making toward closing the Dallas to Houston Safety Case

