ZOOX

SAFETY INNOVATION AT ZOOX

SETTING THE BAR FOR SAFETY IN AUTONOMOUS MOBILITY

VERSION 1.0 / PUBLISHED 2018

ZOOX IS CREATING THE FULL REALIZATION OF SAFE AUTONOMOUS MOBILITY, TODAY.

We believe that just as the combustion engine took society from the age of the horse and carriage to the automobile, autonomous mobility technology will take us to the next era in transportation.

Our vision is to connect people and places in wonderful ways, while at the same time improving public safety and reducing harmful greenhouse gas emissions. Our goal is to imagine this future and build it today, for a safer and more sustainable tomorrow.

This report will provide the reader with a better understanding of how autonomous vehicle technology works, and specifically, how Zoox strives to set the bar for safety in autonomous mobility. We appreciate the opportunity to share the safety foundation we are building now, as we prepare to deploy autonomous vehicles for the public.

Thank you for joining us on this journey.

Jesse Levinson, Ph.D.
Co-Founder & Chief Technology Officer

SAFETY IS FOUNDATIONAL TO THE ZOOX MISSION. WE STRIVE TO SET THE BAR FOR SAFETY IN AUTONOMOUS MOBILITY.

The advent of autonomous technology represents the biggest opportunity to improve the safety of surface transportation since the introduction of the automobile 100 years ago. With robust sensors, advanced software, and rigorous testing, automated vehicles have the opportunity to greatly reduce, and eventually eliminate, the impact of human error at the root of 94 percent of vehicular crashes.

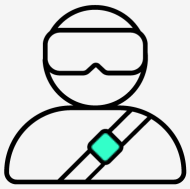
Innovating ways to keep people safe is fundamental to who we are at Zoox. We are on a mission every day to invent and improve how people safely arrive at their destinations.

In this document, we outline the safety foundation that is built into everything we do at Zoox: from testing and validation, to our vehicle design and autonomous software stack, and eventually, a mobility service.

Today, Zoox is testing its software on conventional vehicles with safety operators on public roads across the San Francisco Bay Area, and this is just our beginning. This is Version 1.0 - it's the first report in a series that will communicate the Zoox plan to set the bar for safety in autonomous mobility. Future versions of this report will provide further details of our approach and specific safety innovations as we deploy our fully autonomous mobility service in the coming years.

Mark R. Rosekind, Ph.D.
Chief Safety Innovation Officer
Former Administrator of the National Highway Traffic Safety Administration (NHTSA)
Former Member of the National Transportation Safety Board (NTSB)

IN THE UNITED STATES



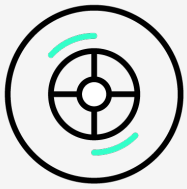
SAFETY

37,133

lives lost in car crashes in 2017

94%

crashes attributed to human error



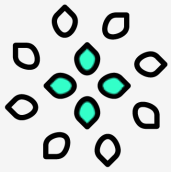
MOBILITY

42

hours lost per commuter in traffic per year

53

million adults with disabilities in 2015



SUSTAINABILITY

96%

amount of time cars sit unused

1,113

million tons of greenhouse gasses emitted by passenger vehicles in 2016

CONTENTS

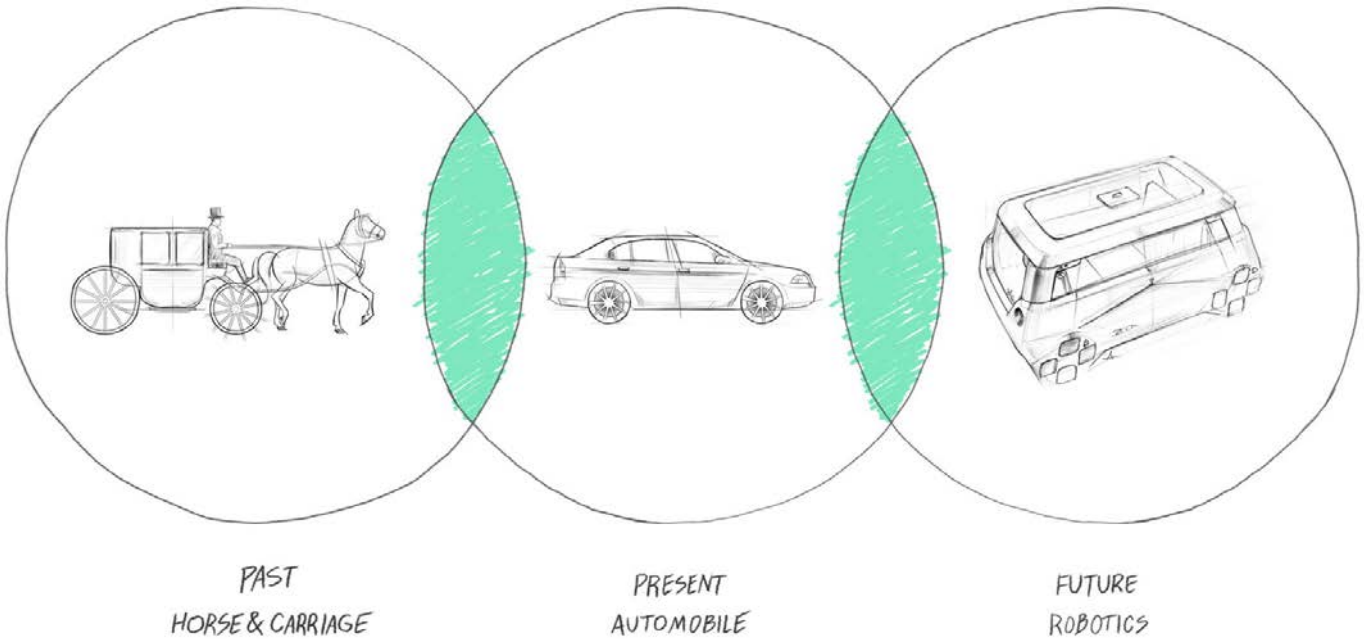
01. OVERVIEW

History

Approach

Safety Philosophy

HISTORY



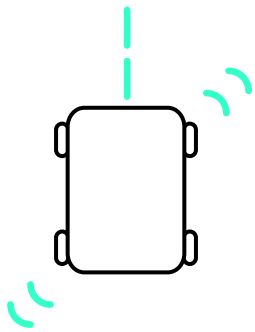
PIONEERS, INVENTORS, BUILDERS.

Zoox was founded in 2014 in Menlo Park, California by Dr. Jesse Levinson and Tim Kentley-Klay, pioneers in the autonomous vehicle industry. Jesse developed algorithms for Stanford University's winning entry in the 2007 DARPA Urban Challenge (an autonomous car competition funded by the U.S. Department of Defense). He went on to lead Stanford's autonomous driving research efforts. Tim previously founded three design and technology-driven companies in Australia, before his interest in autonomous mobility technology brought him to Silicon Valley.

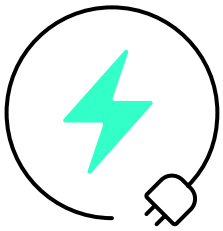
Zoox is a company of inventors and builders. Our Zoox employees possess highly interdisciplinary backgrounds and advanced degrees, with expertise in vehicle and aerospace engineering, safety, robotics, artificial intelligence, machine learning, and product design. Our team members have experience at companies and government agencies including Google, Tesla, Apple, Ferrari, NVIDIA, NASA, NTSB, and NHTSA.

APPROACH

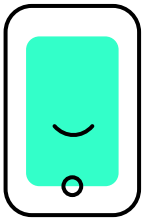
Zoox is building an advanced mobility system to transport people in cities. By focusing on the entire ecosystem, we are developing a cohesive and safe autonomous mobility platform.



FULLY AUTONOMOUS DRIVING



ZERO-EMISSION VEHICLE



MOBILITY-AS-A-SERVICE

Zoox is building an advanced mobility system to transport people in cities. By focusing on the entire ecosystem, including a purpose-built vehicle, software, hardware, and mobility service, we are developing a cohesive and safe autonomous mobility platform.

Our vehicle platform integrates multiple types of sensors with enough redundancy that driving can continue safely if any single component fails. This platform and approach allow for safety and quality of service enhancements that surpass conventional car designs, including those modified for autonomy.

Our full stack software, which is being developed entirely by in-house experts, includes all relevant components of autonomous mobility technology, spanning perception, prediction, planning, control, localization, and mapping.

In addition to developing each component, we will manage the delivery of the entire autonomous mobility service. This will allow us to retain control of fleet safety through our remote operations, operational design domain (ODD), and cybersecurity initiatives.

SAFETY PHILOSOPHY

Autonomous mobility will provide a safety paradigm shift: from reactive to proactive safety.

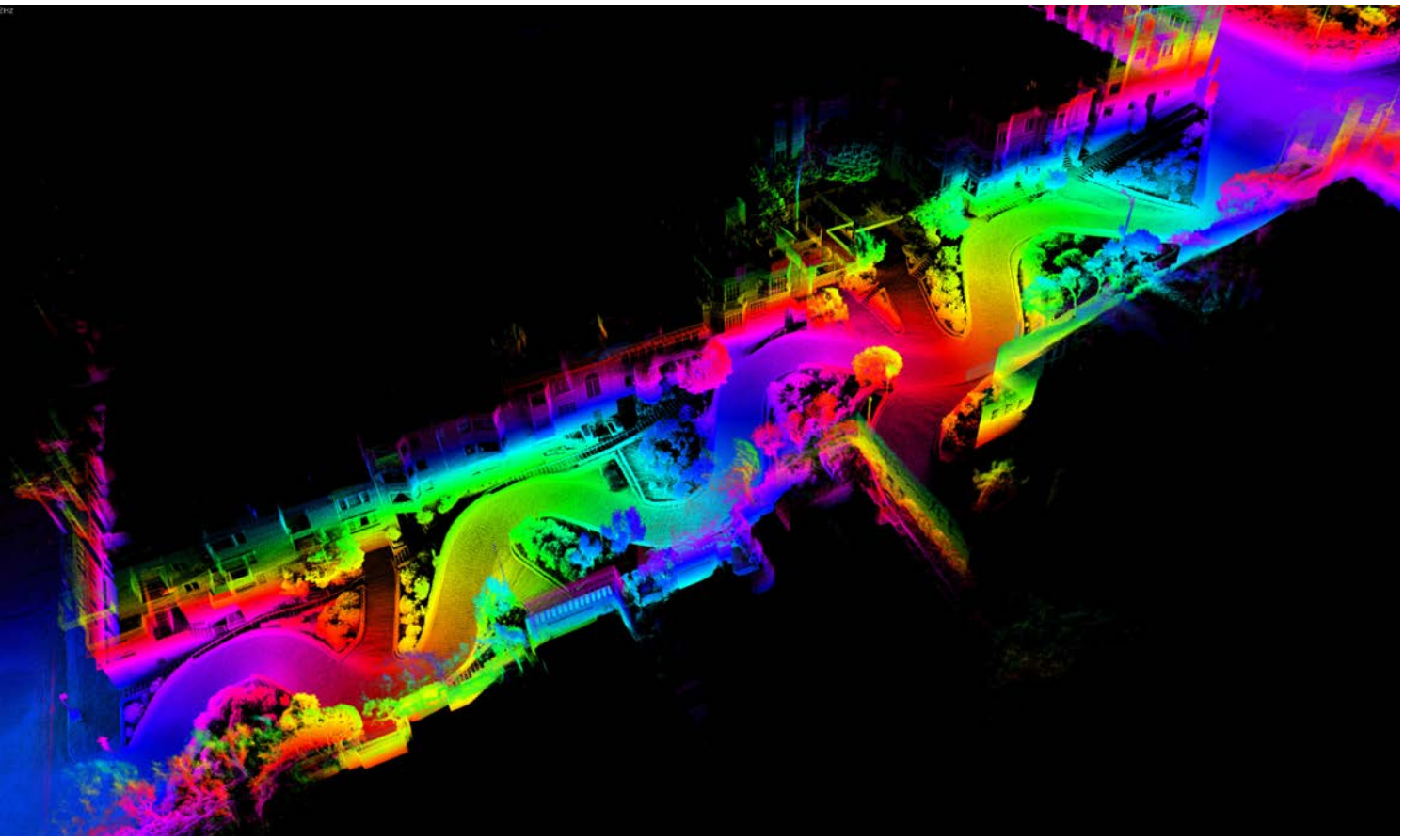
Autonomous mobility will provide a safety paradigm shift: from reactive to proactive safety.

For the past century, automotive safety has been fundamentally reactive. Safety efforts have focused on after-the-fact measures intended to limit the damage caused by crashes. The number of deaths and injuries that still occur on our roads every day shows that this reactive approach to safety falls far short in protecting the public.

Along with autonomous mobility, we need an innovative and proactive safety approach that leverages best practices from multiple industries, including aviation, healthcare, and industrial applications.

Our safety innovation strategy is to 'Prevent and Protect'. Our prevention approach works by analyzing potential safety risks our vehicles will encounter and proactively mitigating them.

The ultimate proactive safety strategy is to prevent incidents from occurring in the first place. Further safety is provided in our vehicles through traditional protection tools - that is, minimizing the harm caused if a crash were to occur.



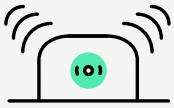
02. HOW AUTONOMOUS DRIVING TECHNOLOGY WORKS

Our Sensor Suite

Our Autonomous Driving Software

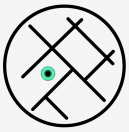
HOW AUTONOMOUS DRIVING TECHNOLOGY WORKS

Zoox has software, hardware, and vehicle engineers working together under one roof to build an autonomous vehicle from the ground up. This integrated approach allows us to develop state-of-the-art strategies for our vehicles to safely drive and interact with the public and other road users. Our engineers address these questions:



What do I see?

Our vehicles perceive their surroundings through a multi-sensor suite. These sensors work together to provide our vehicles with a detailed 360-degree view of the world around it.



Where do I go?

Our vehicles have extremely precise location and planning tools that direct our vehicles to the places our customers want to go. Additionally, we have developed the tools to build and regularly update high-definition 3D maps of the areas our vehicles drive.

How do I learn?

Our vehicles are on the path to fully autonomous driving by learning from detailed simulation, controlled private road and track testing, and public road testing in the San Francisco Bay Area.

What if I get stuck?

In the rare instance a vehicle stops in an unknown situation, it contacts a remote operations center, where an operator will help unblock the vehicle.

> Zoox is building a fully integrated autonomous mobility system to address these questions, and we have made great strides since we started in 2014.
>
> Our system allows Zoox to deliver a mobility experience with safety incorporated by design into every aspect of our service.

OUR SENSOR SUITE

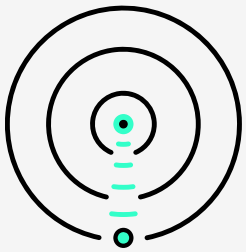
Building a fully autonomous vehicle requires a significantly more robust suite of sensors than cars with advanced driver assist features have today. There are no shortcuts to building a best-in-class, next-generation sensor suite for our vehicles.

No sensor by itself is perfect. That's why our sensor suite includes multiple cameras, lidar (Light Detection and Ranging), radar (Radio Detection and Ranging), and proprietary sensors. Because Zoox is building a vehicle from the ground up, we have optimally placed our sensors in a symmetric configuration to form a real-time, 360-degree view of our vehicle's surroundings. This provides increased detection of other road users and objects near and far, and in all directions.

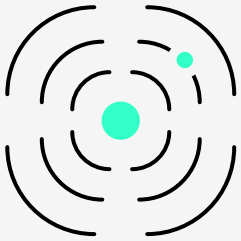
Our sensor suite is designed and tested for safe, reliable operations and provides redundant coverage, should any individual sensor fail.

Our autonomous software takes the sensors' data and seamlessly processes the information. This allows our vehicles to deal with many scenarios that are challenging to human operators, including adverse weather, construction zones, and the navigation of crowded city streets.

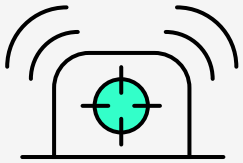
OUR SENSOR SUITE



Lidar (Light Detection and Ranging)
Our lidar sensors help us build a live 3D representation of our vehicles' surroundings. They work by sending out a focused beam of light. When the beam encounters an object, the light is reflected back toward the sensor (laser return). The computer uses this reflection time to calculate the distance from the sensor to that object. By doing this many millions of times per second, the vehicle is able to portray a real-time 3D image of the world around it. Our multiple lidar sensors calibrate automatically with each other to confirm the accuracy of this 3D image.



Radar (Radio Detection and Ranging)
Our radar sensors serve as an object-detection system that help our vehicles reliably measure how far away an object is and its velocity. These sensors work by sending out a short burst of electromagnetic radio waves and measuring how long they take to return. Radar sensors are also very effective regardless of challenging weather and lighting conditions.



Cameras
Our cameras cover varying and overlapping fields of view and ranges. These cameras produce reliable video images that help our vehicles identify objects. The high resolution and color perception of camera images make them well-suited for machine learning algorithms that classify objects by category, which is helpful for prediction and planning. They also excel at detecting small or far-away objects and are the only sensor that can perceive the state of traffic lights.

Other Sensors
We have additional sensors on our vehicles to more reliably and effectively understand our vehicles' surroundings. By using a range of visual and auditory sensors, our redundant sensor systems enable our vehicles to drive safely.

OUR AUTONOMOUS DRIVING SOFTWARE

Our autonomous vehicles are enabled by a seamless interaction between our physical sensor suite and our sophisticated autonomous software.

Through cutting-edge software, our vehicles perceive their surroundings and can predict the likely behavior of other road users, including vehicles, pedestrians, and cyclists. Using this information, our vehicles plan and drive their paths. Underlying this software is a localization functionality, which allows the vehicle to know precisely where it is at all times.

PERCEPTION
Our vehicles can see their surroundings through computer vision technologies. They take the images and data from sensors to detect, track, and avoid all objects, such as other vehicles, traffic lights, cyclists, motorcyclists, and pedestrians. Our state-of-the-art technology uses deep-learning methods to segment and classify objects from our sensor data.

PREDICTION
Zoox vehicles predict the future actions of dynamic road objects, such as other cars, pedestrians, and cyclists, by using a complex software framework that integrates the following:

> **Domain-specific rules**: Our software takes the context of the situation into account (e.g. a car's direction).
>
> **Physics-based modeling:** The software anticipates where a dynamic object will be, given its anticipated speed and acceleration (e.g. a car's direction and speed).
>
> **Data-driven machine-learned behavior modeling:** Our vehicles interpret human behavior and use this information to anticipate the actions of dynamic objects (e.g. a car is veering in a certain direction).

PLANNING
Our planning methodology uses our software's *perception* and *prediction* of what other road objects will do to plan a path for our vehicle. This enables our vehicles to drive where they need to go. Our software is constantly evaluating the vehicle's surroundings and predictions of other road objects' paths to plan its driving actions.

LOCALIZATION
Our vehicles know where they are located at all times with centimeter-level localization software (i.e., we can know our vehicle's location down to a centimeter) based on inertial sensors, lidars and cameras, GPS, and our proprietary mapping data.

MAPPING
High-fidelity maps are crucial for enabling autonomous vehicles to know exactly where they are. We are developing our own mapping technology as well as the maps themselves, which guarantees a high level of resolution and quality.

Since we manage our entire fleet, we can continuously update the maps on all of our vehicles as cities evolve and grow.

03. WHAT MAKES ZOOX VEHICLES SAFE

The following pages describe elements of our mobility system designed and developed around safety objectives.

TESTING & VALIDATION / SIMULATION

We rigorously test and validate our autonomous driving technology. We test our vehicles' capabilities in highly detailed simulations and on private roads and tracks before testing on public roads.

Using a detailed simulation environment is key to developing a road-ready autonomous driving solution. Simulation allows us to significantly accelerate and enhance the development of our software by allowing us to "drive" more miles every day than would be possible in the real world. At the same time, simulation allows us to deliberately focus on less common and more difficult driving scenarios that so often lead to human error in an uncontrolled environment.

While real-world road testing is essential to the development of autonomous vehicle software, it is an inefficient way to collect data on the many unusual driving circumstance that vehicles might encounter.

Zoox makes the investment in and development of our in-house simulation capabilities a top priority. We have built advanced simulation software to accurately replicate the geographies, topographies, and traffic situations typically encountered in urban areas where we plan to operate. Our advanced simulation capabilities allow us to simulate raw sensor data, which allows us to test our entire autonomous driving software stack.

Zoox is positioned to take full advantage of critical simulation technologies underlying the safe deployment of autonomous vehicles.

TESTING & VALIDATION / ON-ROAD

Zoox uses a fleet of test vehicles to test and validate our core autonomous mobility technology.

Our testing fleet includes Toyota Highlanders and Prius C's, which are road-ready and meeting all applicable Federal Motor Vehicle Safety Standards (FMVSS). We retrofit these vehicles with our sensor suite and compute hardware. Zoox has a California DMV permit to test these vehicles on public roads.

Our experienced vehicle testing team performs daily drives around the San Francisco Bay Area. Our current safety protocols dictate that at least two operators must be in the vehicle at all times. We test in various weather and road conditions on private roads, test tracks, and public roads to validate our vehicle's safety design.

Our engineering teams use our vehicles as tools to test and validate our sensor suite and autonomous driving software, to continuously improve our technology.

This tight feedback loop with real-world experience is crucial to the development of a safe autonomous driving system.

Today, our system can drive autonomously in a range of conditions, from suburbs, to freeways at higher speeds, and dense urban environments.

TESTING & VALIDATION / VEHICLE OPERATOR SAFETY TRAINING

Our vehicle operators undergo a thorough and rigorous safety training program.

Each of our vehicle operators is carefully selected through a detailed screening process, which includes a thorough background check, interview, and driving exam.

Our vehicle operators receive over 150 hours of training before we certify them to drive autonomously, and we continue to provide additional training on a regular basis. We have included our Vehicle Operator Safety Training Curriculum in the appendix.

Our safety culture starts by sharing some key values with our operators, which include:

- Initiate a vehicle disengagement any time a potential safety risk is perceived.
- Keep vigilant watch on the road (including a ban on mobile devices while operating).
- Escalate any potential concerns observed in real-world testing.

Beyond that, our full training includes:

Driving School – Our vehicle operators go back to driving school to re-learn driving fundamentals: from the physics of driving to the effects of fatigue.

Safety Training – Our vehicle operators are trained in first aid and fire safety.

Incident Response Training – Our vehicle operators learn how to manage potential risky incidents they may encounter while testing our vehicles.

Software Operations Training – Our vehicle operators are trained on our autonomous mobility software to ensure proper testing and validation.

Autonomous Driving – Our vehicle operators learn how to engage with our vehicles by training on private roads and tracks.

Public Road Testing - After our vehicle operators master autonomous vehicle fundamentals, they begin driving in autonomous mode on public roads.

DEFINING THE OPERATING ENVIRONMENT / OPERATIONAL DESIGN DOMAIN (ODD)

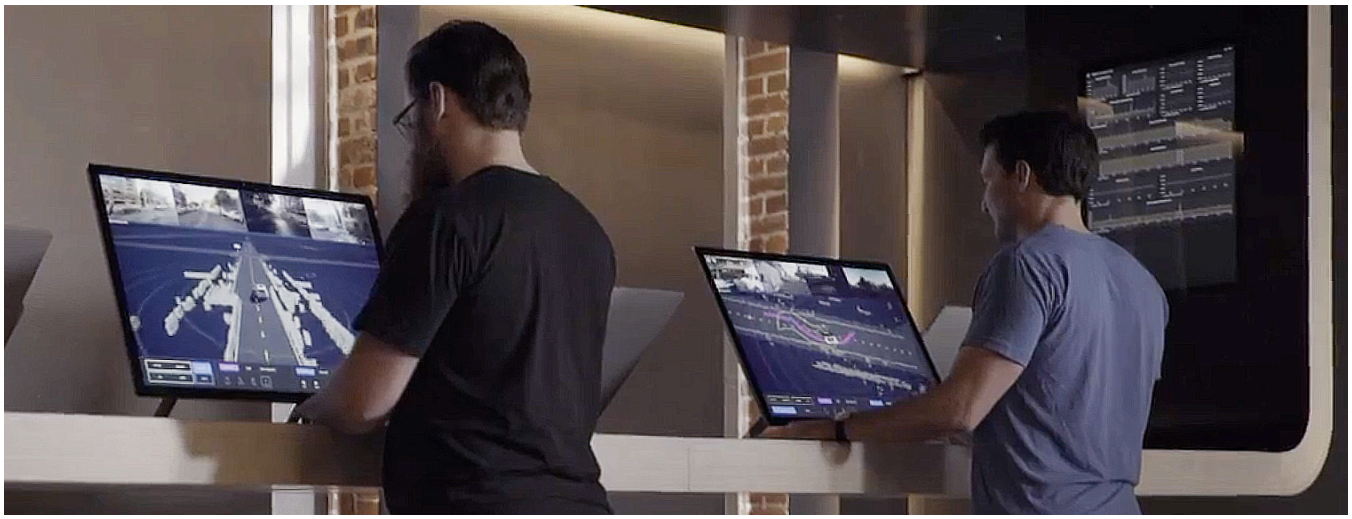
Safety goes beyond the development and testing of our vehicle by ensuring that our vehicles operate safely in a precise operational design domain (ODD). This sets out the conditions and constraints in which our vehicles are designed and validated to operate safely.

Our ODD is designed to ensure our vehicles are prepared to navigate roadways, comply with local traffic laws and regulations, maintain safe speed ranges, and navigate environmental conditions (e.g. weather and time of day).

Once we deploy our fleet of vehicles into service, we will continue to use the ODD to provide clear driving parameters for our vehicles. Zoox's ODD will expand to include more locations and conditions as we continue to gather data validating that we can drive safely in more areas and situations.

Since Zoox will manage its own fleet, we will know the condition and status of all of our vehicles. If needed, we will be able to adjust the ODD across the entire fleet to ensure safe operations.

REMOTE OPERATIONS TO MANAGE UNCERTAIN SCENARIOS



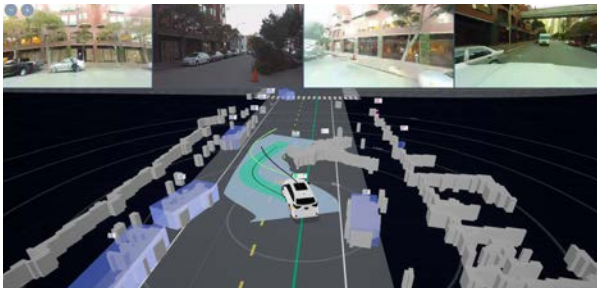
When our fully autonomous vehicles are on the road, they may encounter an unknown situation and not be sure how to maneuver in a way they have not been taught (e.g. negotiating an intersection with a traffic light out and a police officer directing traffic). If this happens, the vehicle will signal a remote Zoox operator to assist and guide the vehicle safely and efficiently until normal conditions resume.

The Zoox remote operations support center will have operators available to remotely guide a Zoox vehicle at any time, day or night, when a vehicle encounters an uncertain driving situation, such as a traffic light outage or a road obstruction.

When our vehicles encounter an uncertain or unknown situation, they shift into a 'minimal risk condition' and come to a safe stop. Our remote operators then provide guidance, and the vehicle resumes driving when the timing is appropriate and safe. The Zoox vehicle remains in autonomous mode at all times, with the remote operator instructing, rather than directly controlling the vehicle, in order to reduce the possibility of human error.

We guard against weaknesses in network connectivity and maximize the speed of data feeds by connecting Zoox vehicles to multiple cellular networks simultaneously.

Here is an example:



1. Our vehicle encounters a fallen tree on a busy street.

2. Our vehicle comes to a safe stop in front of the tree and requests guidance from our remote operations center.

3. The Zoox operator receives real-time video and sensor feeds from our vehicle to understand the full context of the situation (e.g., road obstruction, police presence, etc.).

4. Our operator provides guidance for a clear and safe path around the tree.

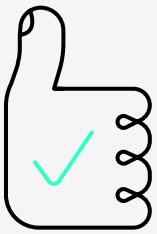
5. The vehicle then determines when the time is safe to follow the recommended path and is soon back on its way.

MANAGING CYBERSECURITY THREATS

The cybersecurity of our vehicles is a very serious concern, and we are always vigilant for potential threats - and solutions. Zoox has a dedicated team that oversees and continually tests our security infrastructure and strategy to ensure that we are making full use of the latest security technology.

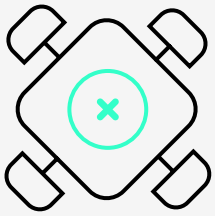
We structure our approach to cybersecurity around three principles:

1. Using established best practices
2. Developing new cybersecurity architectures
3. Constantly upgrading our functional security



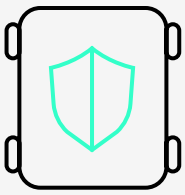
Industry Best Practices

We have incorporated best practices from key industry organizations including the Society of Automotive Engineers (SAE), the National Institute of Standards and Technology (NIST), and the Automotive Information Sharing and Analysis Center (Auto ISAC). At the same time, our integrated approach enables us to develop our own superior standards.



Cybersecurity Architecture

We incorporate cybersecurity into our architecture by design. Zoox vehicles are not connected to and cannot be accessed from the Internet. Instead, they send and receive data exclusively on a dedicated and encrypted mobile network. All software updates are pulled via a local repository; no external entity can initiate contact with the vehicle's autonomous mobility software or directly control the vehicle's driving capabilities.



Functional Security

Another advantage of developing our vehicles from the ground up is that we have designed them to have no physical access points or ports to our network or hand controls - preventing anyone inside or outside the vehicle from hacking into our vehicles.

Since Zoox manages all aspects of our fleet, no outside entity can take ownership of a Zoox vehicle to reverse engineer our security software. We know where our vehicles are and will be able to regularly test and diagnose our vehicles for any security threats.

VEHICLE ARCHITECTURE

The full realization of autonomous mobility will dramatically change how vehicles look, feel, and drive. Given this historic opportunity, we are revolutionizing vehicle safety from the ground up.

Our next generation all-electric vehicle will be built from scratch with innovative designs and safety principles incorporated throughout the design and manufacturing production process.

Setting the bar for safety in autonomous mobility means that where possible, our vehicle design will exceed many existing safety standards.

Here are some vehicle innovation areas:

Our fundamentally redesigned vehicle platform includes bidirectional driving and four-wheel steering. This provides our vehicles with innovative ways to navigate city driving safely.

Our electric powertrain enables our vehicles to drive more precisely and safely in the areas where we operate.

We have reimagined cabin safety features to better protect all passengers in the unlikely event of a collision.

Our vehicles will use light and sound to communicate with pedestrians, cyclists, and other road users.

REDUNDANT SAFETY FEATURES

Our vehicles are designed to operate safely even if any single system were to fail, because we have designed fault tolerant redundancies throughout. We started by incorporating best practices of systems engineering and functional safety from aviation, automotive, and industrial applications into our system.

We have a specialized 'System Design and Mission Assurance' (SDMA) team, whose mission is to analyze, design, and implement functional safety into our system. SDMA focuses its energy and resources into searching for points where failures may occur. With that knowledge, Zoox determines ways to safely mitigate these risks, and we build in appropriate redundancies to increase system safety.

For example, with safety-critical design elements, we regularly test our vehicles for any common cause failures, in which two or more identical hardware elements could fail within a specified time.

To mitigate the risk of hardware failure, we have developed a mixed hardware strategy - wherever possible, hardware elements have unique features to guard against a common failure.

Here's how we are using redundancies for safety:

Our innovative steering system and bidirectional driving platform gives our vehicle primary and backup steering systems.

Our braking system features multiple technologies to ensure we have backup functionality whenever needed.

Our battery and powertrain are designed to avoid a single point of failure that could leave our passengers and vehicle without power.

REGULATIONS & COMPLIANCE

In this new era of autonomous mobility, we acknowledge the need to reevaluate traditional approaches to public policy, regulations, and compliance. We also see new opportunities to innovate better approaches to safety.

As we prepare to deploy our technology safely for the public, we appreciate the opportunities to collaborate and share knowledge with regulators at the federal, state, and local level as they devise effective safety policies.

DATA SECURITY

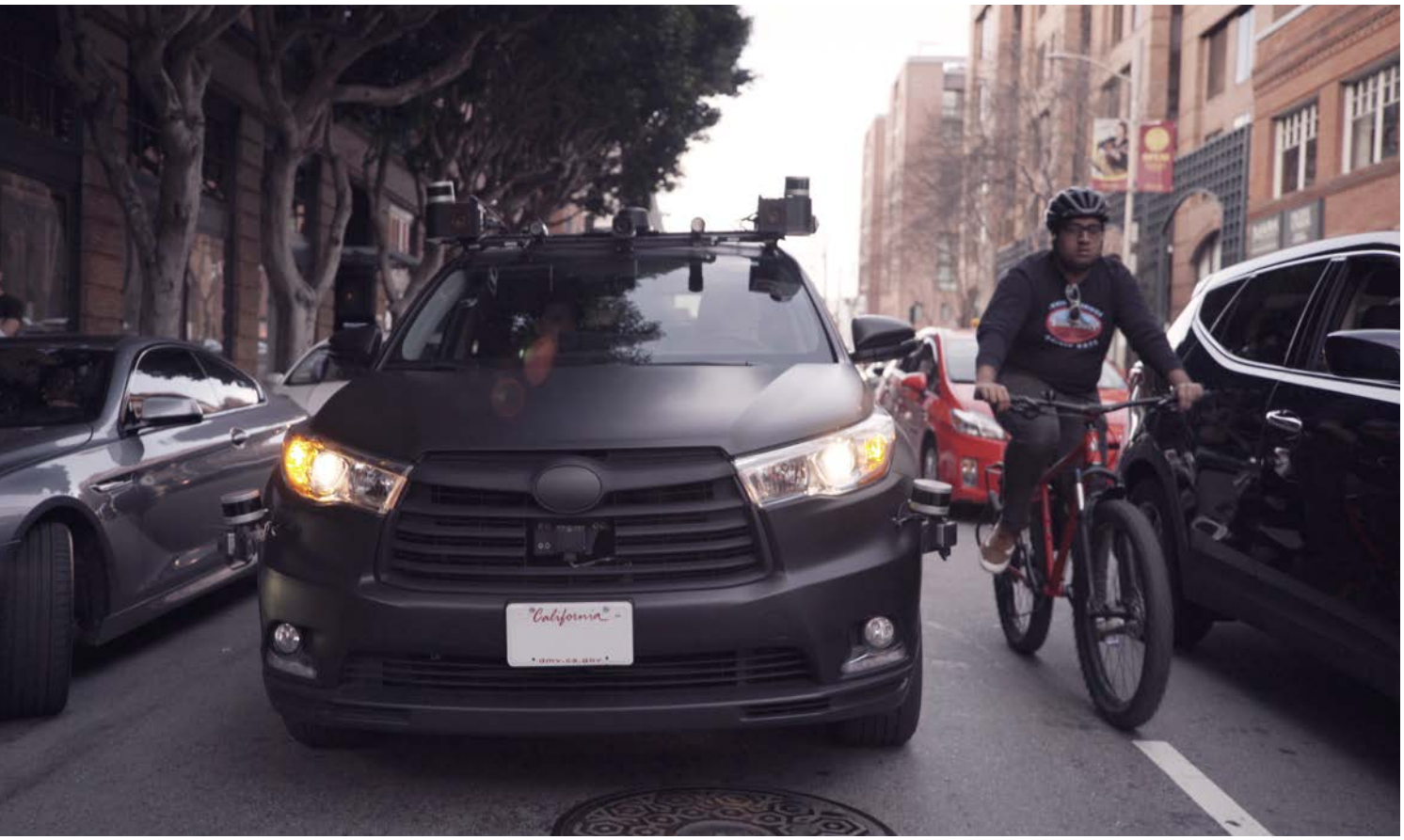
Zoox is a data-driven company, and with that comes certain responsibilities. Our system collects vehicle data that helps us continuously improve our autonomous mobility technology during our research and development (R&D) phase.

Data collection continues if our vehicle experiences an incident. Our vehicles collect sensor and video data, so that we are able to fully understand the nature of the incident. We will comply and assist law enforcement as necessary with relevant and proper data requests.

We store data on our vehicles securely. It is also backed up at our operations centers.

Post-incident data will be analyzed according to principles used in aviation and other modes of transportation. These methods are comparable to the cockpit voice recorder and the flight data recorder. Our system captures the relevant 'what' and 'why' data in the moments before and after an incident, including video and sensor information that allow determination of what happened during the incident.

In addition, we know how important personal data security is. We will maintain the public's trust by keeping customers personal data secure and in compliance with industry and regulatory standards. We are also committed to being transparent with our customers about privacy and our use of their data.



04. HOW ZOOX VEHICLES WILL INTERACT SAFELY WITH THE PUBLIC

Law Enforcement Engagement

Accessibility

LAW ENFORCEMENT ENGAGEMENT

We are collaborating with law enforcement and first responders to increase public safety as we build our autonomous electric vehicle fleet.

These dedicated safety professionals are aware of the consequential changes that autonomous mobility technology will soon bring to transportation. It is vital that they are well informed about how these new technologies function and how to effectively interact with these vehicles.

To address these important safety opportunities, Zoox continually interacts with law enforcement professionals and first responders. We engage diverse groups of local officials to learn what features are most helpful for them to interact with our technology - and how to correct for the most common and dangerous human errors they see in their daily work. Their insights and experience are informing our design of a more robust autonomous mobility system.

We are developing an integrated engagement program for law enforcement and first responders to become informed about autonomous technology and our vehicles. We will offer a range of training materials and services:

Immersive educational information provided in-person and online to train first responders how to safely interact with our autonomous vehicles.

Operational training exercises simulating realistic scenarios to train on best practices.

Vehicle disengagement guide which will provide first responders with a quick reference on how to interact with our vehicles.

Ongoing interactions to ensure information and training are continually enhanced.

ACCESSIBILITY

We strive to improve access to mobility services in the communities we serve. As life expectancy increases, the population of seniors who no longer can - or want - to drive will grow as well. And people with disabilities, regardless of age, often find conventional car configurations very limiting and face challenges in finding transportation options.

We want an autonomous Zoox vehicle to provide opportunities for safe mobility for all people to lead fuller lives, whether that means getting to work or a doctor, shopping independently or spending time with family and friends. These are all possibilities that can be realized through safe autonomous mobility.

In order to maximize the benefits of this technology, we are working with a diverse group of advocacy organizations to design features that will enhance the accessibility and comfort of our vehicles. We will continue learning from all communities to have our service be as inclusive as possible.

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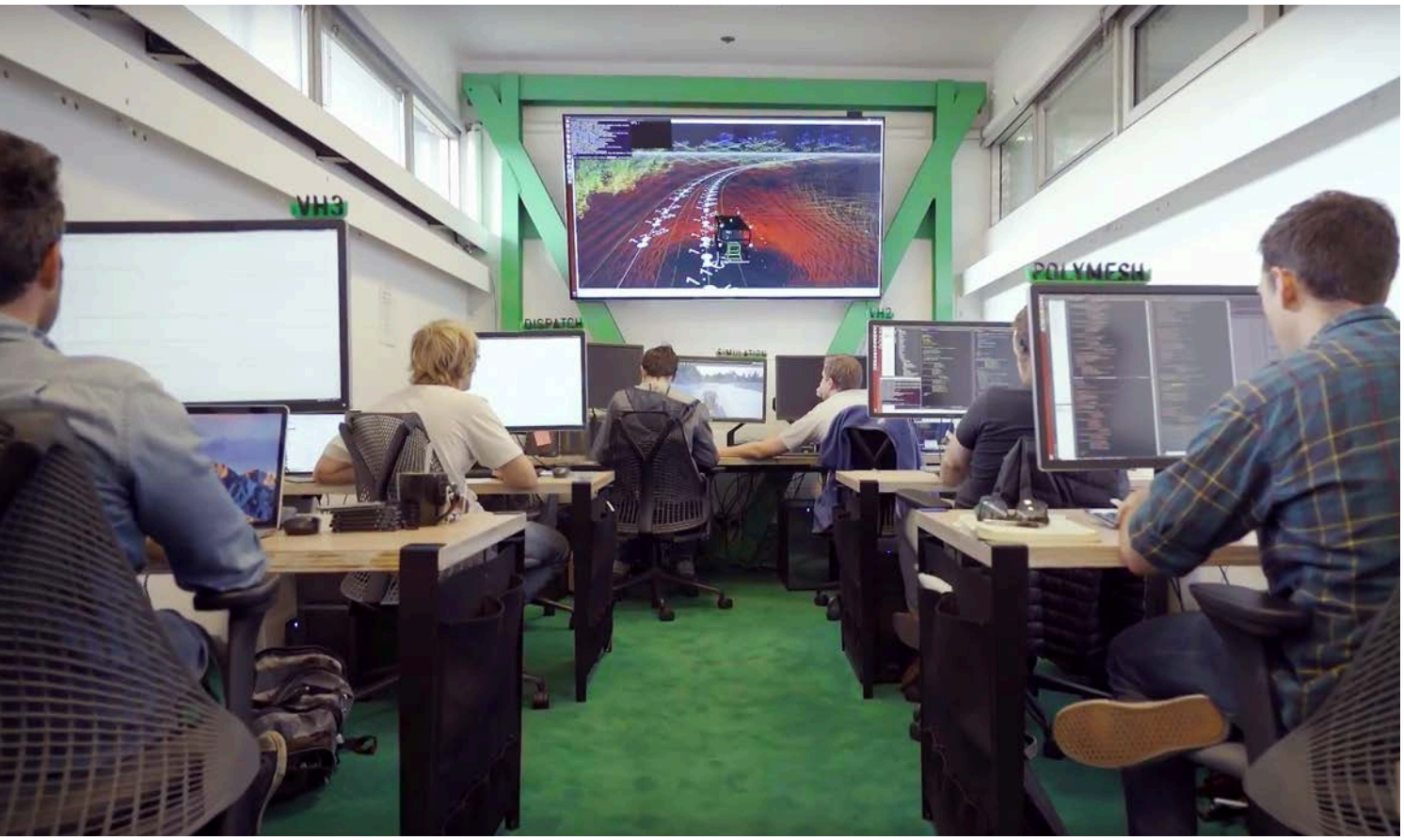
05. CONCLUSION

We believe that our autonomous mobility technology can fundamentally improve city living by increasing road safety, providing mobility solutions for people, and reducing carbon emissions.

We want you to join us on this journey.

Please learn more about our efforts to build a safe autonomous mobility system at zoox.com.



06. APPENDIX

NHTSA's Automated Driving Systems 2.0 Safety Design Elements

Vehicle Operator Safety Driving Curriculum

NHTSA'S AUTOMATED DRIVING SYSTEMS 2.0 SAFETY DESIGN ELEMENTS

Our focus on safety innovation emphasizes the tremendous opportunities to enhance public safety with new technology that will enable autonomous mobility. We strive to set the bar for safety in autonomous mobility.

In the *Safety Innovation at Zoox* report, we have addressed the 12 Safety Design Elements included in NHTSA's "Automated Driving Systems 2.0: A Vision for Safety" with the location of each identified on the following list.

NHTSA's 12 Safety Design Elements	Safety Innovation at Zoox
System Safety	Throughout Report
Operational Design Domain	Defining the Operating Environment (ODD)
Object and Event Detection and Response	Our Sensor Suite & Autonomous Driving Software
Fallback (Minimal Risk Condition)	Remote Operations to Manage Uncertain Scenarios
Validation Methods	Testing and Validation
Human Machine Interface	Throughout Report
Vehicle Cybersecurity	Managing Cybersecurity Threats
Crashworthiness	Vehicle Architecture
Post-Crash ADS Behavior	Throughout Report
Data Recording	Data Security
Consumer Education and Training	Throughout Report
Federal, State, and Local Laws	Regulation & Compliance

VEHICLE OPERATOR SAFETY TRAINING CURRICULUM

1. Vehicle Overview - The vehicle inspection module will cover basic OEM operation, exterior inspection of hardware (OEM and proprietary), inspection of interior controls, actuation and validation of Zoox's systems, including the sign-off process.
    a. OEM equipment overview - Standard vehicle controls, actuation and test
    b. Zoox proprietary vehicle system controls, actuation and test
    c. Vehicle alerts - Audible, visual, and haptic
    d. Equipment Checklist - Inspection process, sign-off and "clear to operate"

2. State of California: Rules of the Road - This module reviews California traffic and street regulations. It will focus additionally on pedestrian and cyclist awareness, and proactive vs. reactive driving. This module will also cover the CA DMV Autonomous vehicle regulation, protocols and acknowledgement.
    a. California Driver Handbook
    b. Speed limits
    c. Pedestrian and cyclist right of way
    d. Defensive driving practical
    e. Autonomous vehicle DMV regulations

3. Autonomous Driving System Technology: Vehicle systems - This module covers Zoox proprietary systems in detail.
    a. Operational Design Domain
    b. Software
    c. Operator guidelines
    d. Cutoff/manual control take-over
    e. Data logging
    f. Autonomous capabilities and limitations

4. Incident Response Procedures - The emergency module will review contingency plans in the event of an incident. We will cover minor to major incident protocol, response, emergency and management contacts.
    a. Injury vs. No injury
    b. Insurance card and coverage
    c. Notifying management and key contact information

5. Behind the Wheel: Driving - This module is a practical evaluation of driving skill, attention to pedestrians, traffic and rules of the road. It will then progress to hands-on training on the use of Zoox's proprietary systems and contingency use.
    a. Manual driving
        — Vehicle physics
        — Understeer/Oversteer
        — Braking capability/ABS
        — High speed lane change
        — Awareness, fatigue
    b. Autonomous Driving
        — Engaging/Disengaging autonomous mode
        — When to take over manual control
        — Roles and responsibilities/Communication
    c. Field reporting

6. Vehicle Test Plan
    a. Test plan overview
    b. Checking in a vehicle - Autonomous system shutdown, Chocking tires, Post-drive inspection
    c. CA DMV Reporting Requirements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