



Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO



Application to Test Automated Driving Systems on Public Ways in Massachusetts

CONTACT INFORMATION:

Name of Organization: Motional AD Inc.

Primary Contact Person: [REDACTED]

Title: Testing Operations Manager

Email Address: [REDACTED]

Tel. No.: [REDACTED]

Street Address of Company's Headquarters Office: 100 Northern Avenue, Suite 200

City, Town of Headquarters Office: Boston

State: MA

Zip Code: 02210

Country: USA

Mailing Address of Headquarters Office (if different): N/A

Website: <https://motional.com/>

PHYSICAL PRESENCE IN MASSACHUSETTS:

Primary Massachusetts Contact Person (if different): N/A

Title: N/A

Email Address: N/A

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Street Address of Company's MA Office (if different): N/A

City, Town of MA Office: N/A

State: N/A

Zip Code: N/A

Country: N/A

Mailing Address of MA Office (if different): N/A

CERTIFICATION:

The Applicant certifies that all information contained within this application is true, accurate and complete to the best of its knowledge.

DocuSigned by:

Naisy Flannery
Signature of Applicant's Representative

Naisy Flannery
Printed Name

7/26/2023
Date of Signing

Testing Operations Manager
Position and Title

[REDACTED]
Email address

[REDACTED]
Tel. No.

Detailed Information

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Notes: Applicants should not disclose any confidential information or other material considered to be trade secrets, as the applications are considered to be public records. The Massachusetts Public Records Law applies to records created by or in the custody of a state or local agency, board or other government entity. Every record that is made or received by a government entity or employee is presumed to be a public record unless a specific statutory exemption permits or requires it to be withheld in whole or in part. The exemptions are strictly and narrowly construed. More information on the Commonwealth's Public Records Law can be found on the [Secretary of the Commonwealth's website](#).

The Application and Detail responses should meet the Web Content Accessibility Guidelines (WCAG) 2.0 A and AA standards (see Guidelines for Accessible Electronic Document Creation).

MassDOT shall regularly review the technological advancements, federal policy progress, and developments in the automated driving systems industry and thereby adjust or modify this Application and associated requirements as appropriate.

Detail # 1: Experience with Automated Driving Systems

Please provide information describing the Applicant's experience testing ADS-equipped vehicles within at least the preceding 12 month period.

1) A brief history of the Applicant's business as it regards ADS-equipped vehicles

Karl Iagnemma, former Principal Research Scientist and Director of the Robotic Mobility Group at MIT, has been developing autonomous vehicles ("AVs") since 2005. After being part of the historic 2007 DARPA Challenge, Karl co-founded nuTonomy, one of the world's first AV start-ups, in 2013. In 2017, Aptiv, a Tier 1 automotive supplier who had been testing AVs since 2014, acquired nuTonomy to complement its existing AV technology program. In 2020, Motional was formed as an autonomous driving joint venture between Aptiv and Hyundai Motor Group. Motional has established itself as one of the world's leading AV companies and is uniquely positioned to deliver on the promise of AVs for improving the safety, efficiency, and accessibility of transportation.

Aptiv, one of Motional's parent companies, has tested AVs on private courses in Massachusetts, Michigan, Pennsylvania, Nevada, Singapore, and the United Kingdom; and on public roads in Massachusetts, Pennsylvania, Nevada, California and Singapore. The company conducted the first coast-to-coast automated drive in the United States in 2015. In 2016, Aptiv was the first to commercially deploy autonomous vehicles globally by partnering with ride-hail company Grab in Singapore to launch the first public deployment of AVs on a ride-hail network.

Today, Motional operates in multiple cities around the globe, across a range of driving conditions and environments. To date, the company has provided more than 130,000 public autonomous rides, with 95 percent of rides resulting in five-star ratings. In 2022, Motional announced expansions of its commercial partnerships with Uber and Lyft. Through these partnerships, Motional will serve Uber and Lyft customers in Las Vegas and Los Angeles, as well as other major cities in the future.

Motional's new AV is the all-electric IONIQ 5 robotaxi, developed in close collaboration with Hyundai. The IONIQ 5 robotaxi is based on the award-winning consumer model IONIQ 5 and is equipped with over 30 sensors to enable fully driverless operation. Motional currently uses the IONIQ 5 robotaxi for its testing in Boston.

- 2) A general summary of the Applicant's experience testing on private ways (closed to the public) and public ways (while the road was open to other road users), including for example:**
- a) Private test facility name(s), location(s), and a sample of photographs, videos, roadway cross sections, or detailed description of road types and testing activities**

We utilize closed-course testing sites in every market where our AVs operate on public roads. The facilities we currently use are:

1. Boston - Suffolk Downs
2. Las Vegas - Las Vegas Motor Speedway
3. Pittsburgh - Nearby private parking lot
4. Singapore - Centre of Excellence for Testing & Research of Autonomous Vehicles

We use these facilities to comprehensively validate software and hardware changes before we approve them for use on public roads. The closed course also allows us to safely train new Testing Operator members of the team to gain familiarity and comfort of the AV before going on public roads. Our facilities are equipped with a variety of road markings, street signs, and traffic lights to replicate scenarios found on public roads in the various markets and Operating Design Domain (ODD) in which we operate. Road types at these sites include, but are not limited to; bi-directional roads with two to four lanes, medians, slip lanes, roundabouts, dedicated turn lanes with two-way and four-way stop-sign-controlled intersections, and traffic light intersections with and without turn arrows. The Singapore facility, in particular, also has equipment to simulate testing in heavy rain and "urban canyons" (where there are tall buildings on either side of the roadway), both of which pose challenges to AVs.

Some examples of the roadways we test on throughout the United States can be found in Exhibit F: Testing Plan.

b) Public ways testing location(s) and a sample of photographs, videos, roadway cross sections, or detailed description of road types and testing activities

We currently operate on public roads in five cities in varying levels of complexity: Boston, Pittsburgh, Singapore, Las Vegas, and Los Angeles. Road conditions in these cities include uni-directional and bi-directional travel with one to six lanes, turn lanes, medians, reversible lanes, stop sign and traffic light-controlled intersections, bike lanes and sharrows, pedestrian crossings, roadside parking, and driveway entrances.

We conduct research and development testing in Boston, Pittsburgh, Singapore, and Las Vegas Los Angeles. The Seaport and Downtown areas of Boston and the One North and Queenstown areas of Singapore are heavily traveled neighborhoods used for urban testing with a dense mix of pedestrians, bikes in and out of bike lanes, vehicles of all sizes, signalized intersections, and ever-changing construction zones. The Southside area of Pittsburgh and certain areas of Boston's Seaport and Downtown neighborhoods are used for testing in residential and industrial environments.

In Las Vegas, we operate a public robotaxi service in partnership with Lyft and Uber. We operate in the downtown area and on Las Vegas Blvd. Our testing activity in Las Vegas focuses on user experience testing as well as testing in an environment that includes heavy multi-lane vehicle traffic, signalized intersections, and dense pedestrian activity.

Currently we test in daylight, dusk, dawn, nighttime, low light; light snow and rain; light to moderate wind and fog. Outside of Massachusetts, we test our vehicles up to speeds of 45 MPH.

c) The amount of testing conducted on public and private ways (for example in miles, hours, frequency per day, week, or month, or other metric(s))

We test our AVs daily on public and private roads up to 24 hours per day in Las Vegas and up to 40 hours per week in each of the locations in Pittsburgh, Boston, Los Angeles, and Singapore.

d) The type(s) of vehicle(s) used for the testing

We currently operate exclusively with the all-electric IONIQ 5 robotaxi.

e) The SAE J3016 Level(s) of the ADS which was tested

We are currently testing Level 4 ADS.

f) The operational design domain(s) which were tested, including geographical conditions, roadway types, speed ranges, environmental conditions, and other domain constraints

Our AVs have operated in urban driving environments, including streets in which heavy vehicle traffic, cyclists, and pedestrians are present. At our current stage of development for AVs used in Massachusetts, we limit the speed of our AVs to a max of 35 mph. We have operated our AVs safely in daytime and nighttime and in windy, rainy, and snowy conditions both in closed-course and public road environments. We continuously validate all vehicle performance and behavior changes to our AVs in simulation then in a closed-course setting before operating them on the public roads.

g) The governmental entity that approved and/or monitored the public ways testing, if any

Our public road testing is approved and monitored by the Massachusetts Department of Transportation (MassDOT), the City of Boston, and Economic Development Industrial Corporations (EDIC). Outside of Massachusetts, we have received Automated Vehicle Testing authorization from the Pennsylvania Department of Transportation (PennDOT) and participate in the City of Pittsburgh's voluntary AV testing program, working with their Department of Mobility and Infrastructure. In Nevada and California, we have approved permits to test autonomous vehicles on all public roads from the respective state DMV's. At the federal level, we work in close collaboration with the National Highway Traffic Safety Administration (NHTSA) and the US Department of Transportation (USDOT). Motionai goes through an individualized route-by-route approval process for its testing plans for imported vehicles with NHTSA, and also complies with detailed federal collision reporting obligations.

Internationally, we have received approval from Singapore's Land Transport Authority (LTA) to test autonomous vehicles. Initially, this was only for a small portion of the neighborhood of one-north. The testing area was doubled in 2016, and based on our continued success, this area has gradually expanded to encompass large swathes of the country's public roads. In 2021, Motional passed the Singaporean government's "Milestone 2" testing process, a benchmarked progress indicator which reflects an official determination that a company can safely conduct testing of autonomous vehicles with a safety driver in a complex environment.

h) Results of the testing

We continuously improve our software using data we gather from our testing to identify local driving patterns, behavior of other road users (e.g., pedestrians and cyclists), and unique situations that require a system that performs beyond the written rules of the road (e.g., navigating around double-parked cars and yielding for pedestrians crossing against the signal). By improving our software it also allows us to make improvements to the AV itself such as expanding its ODD capabilities and ensuring passenger comfort.

3) A description and summary of any major crashes that resulted during testing on public ways by the Applicant:

- a) A description of the nature of physical damage to the vehicle or vehicles and or other personal or private property**
- b) Whether there was a determination of fault**
- c) Whether any personal injuries or fatalities occurred as a result of the crash, and if so, the seriousness of any injuries**
- d) Whether an official report of the crash or crashes were reported to police or other governmental agencies, and if a report or reports were filed, to whom they were filed**
- e) Whether any of the standard safety features on the vehicle were disabled at the time of the crash**

We have never had an at-fault (by our technology or Testing Operators) incident or a major crash while testing in autonomous mode on public roadways.

Detail # 2: Operational Design Domain

The Operational Design Domain must define the domain(s) in which the ADS is designed to properly operate, including but not limited to geographical conditions, roadway types, speed ranges, environmental conditions, and other domain constraints for testing which is anticipated to occur in Massachusetts within the approval period.

1) Time of Day**a. Daytime (Sunrise – Sunset)**

Yes

b. Nighttime (Sunset – Sunrise)

Yes

2) Environmental Conditions**a) Clear and Fair Weather: no rain, fog or snow**

Yes

b) Light Rain and Fog: less than 5 mm/hr rate of rain and fog with limited impact on visibility

Yes

c) Moderate Rain and Fog: less than 10 mm/hr rate of rain and fog with limited to moderate impact on visibility

No

d) Heavy Rain and Fog: less than 20 mm/hr rate of rain and fog with moderate to high impact on visibility

No

e) Light Snow: less than or equal to 10 mm/hr rate of unmelted snowfall, and visibility of at least 1 km

No

f) Moderate Snow: greater than 10 mm/hr and less than or equal to 25 mm/hr rate of unmelted snowfall, and visibility of at least ½ km

No

g) Heavy Snow: greater than 25 mm/hr and less than 50 mm/hr rate of unmelted snowfall, and visibility of at least ¼ km

No

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- h) Severe Weather: greater than 20 mm/hr rate of rain and fog with high impact on visibility, or greater than 50 mm/hr rate of unmelted snowfall and visibility of less than ¼ km**

No

3) Road Typologies and Speeds

- a. Functional Classifications (Local Roads, Collectors, Arterials, Other Road Types)**

Local Roads, Collectors, and Arterials

- b. Limited Access (Motor Vehicles Only) or Multi-Modal (Mixed Traffic)**

Multi-Modal

- c. Single or Multiple Lane**

Multiple

- d. Maximum Operating Speeds**

25 MPH in MA and PA, 35 MPH in NV and CA

4) Situational Constraints

- a. Construction and Active Work or School Zones (Including Traffic Officers)**

No: Construction, Active Work and School Zones

No: Traffic Officers or areas with temporary signals (such as lights)

- b. Signalized Intersections**

Yes

- c. Unprotected Left Turns**

Yes

- d. Unsignalized Crosswalks**

Yes

- e. Rotaries and Roundabouts**

Yes

- f. Other Situational Constraints**

Detail # 3: Summary of Training and Operations Protocol

Attach a summary of the type(s) of training required of employees, contractors and/or other persons designated by the Applicant as Test Drivers, and related

operational protocols for testing on public ways. Such summary should include but is not limited to:

A) A general description of the training and instruction provided on private facilities and public ways, including how a test driver is made aware of the limitations of the ADS and the safe operating parameter(s) for a given ODD

Our Testing Operator (“TO”) training program consists of three parts:

1. E-learning

Provides trainees conceptual instruction to prepare for a role as a Testing Operator. Computer-based instruction via our **learning management system (LMS)** familiarizes TOs with Motional’s autonomous vehicle fleet, including technology orientations. All topics are assessed in a comprehensive exam at the end of the training.

2. In-vehicle Training

TO candidates begin training by observing both **Safety Driver** (SD) left seat and **Safety Operator** (SO) right seat roles as a back-seat passenger. Following the observation period, Testing Operators will begin in-vehicle (field) training for both roles. TO Trainers and Operations Leadership certify the new hire TO at the end of their training period once the TO has successfully performed all required training tasks on their on-the-job training checklist. Moving forward, a TO's in-vehicle safety knowledge is measured through an annual recertification.

3. Recertification

Recertification is required once a year, following initial certification of new hire training. As our fleet, business, and the autonomous vehicle (AV) environment evolve, we continually assess the need to update and add coursework and certification criteria.

Recertification will be required if a Testing Operator is placed on a performance improvement plan or upon return from a leave of absence before or after the annual cycle. An extended leave of absence is defined as 30 calendar days or more.

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If the Testing Operator is out on an extended leave of 60 calendar days or more, there may be additional training requirements before they are permitted to operate the vehicle in autonomous mode as part of their daily work.

B) Mission

Motional's mission is to consistently and comprehensively prepare Testing Operators for their safety-critical role handling the autonomous vehicle. Testing Operators are vetted and trained through learning experiences, opportunities to practice, individualized coaching, and access to the resources required to be a safe, proficient autonomous Testing Operator.

The goals of the training protocol are to teach TOs:

- How the AV operates, relative to both hardware and software
- Safe driving habits
- How to respond to incidents
- How to be a safety-oriented, positive and proactive member of the Operations Team

C) Hire Criteria, and New Hire Training Requirements**New Hire Requirements:**

As required by state law, TOs must have a clean driving record for three years and no DUIs for ten years prior to commencement of employment. We require drug testing and background checks before hiring, as well as a third-party driving evaluation on a closed course.

New Hire Training

Upon hiring, every Testing Operator undergoes extensive vehicle-based eLearning and in-vehicle (field) training. The TO Training Program includes a common foundation of content across all sites, ensuring consistent global AV training, safety practices & procedures, and various skill sets.

In addition to the foundational concepts offered, new hires are provided

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site-specific and/or market-specific training content such as local driving laws, local programs (rideshare, pilots, etc.), and facilities safety.

Upon completion of all e-learning and instructor-led classroom course materials, the new hire TO will be paired with an experienced TO Trainer. The TO Trainer will demonstrate expectations of in-vehicle operations and other job-related duties of daily work. The new hire TO cannot begin in-vehicle autonomous vehicle training until they have completed the corresponding e-learning/classroom course material.

After the new hire TO completes in-vehicle training, the TO Trainer and the new hire's manager will certify that the new hire TO is able to safely perform the job duties without the supervision of a trainer. The TO Trainer and new hire's Manager use the e-learning curriculum and in-vehicle training drills to certify a new hire for job readiness. After that, Motional measures a TO's in-vehicle safety knowledge through annual recertification.

Continued Education (CE)

To facilitate the professional growth and development of Testing Operators, continued education (CE) will be available in the LMS. Most CE courses are optional but can be assigned by management as desired.

D) Recertification & Performance Management**Annual Recertification:**

Recertification is the combination of completing an e-learning exam and in-vehicle evaluations. The e-learning exam measures comprehension of the material covered in e-learning coursework. The in-vehicle evaluation consists of an Operations Leader observing a Testing Operator's ability to safely perform a series of tasks and/or maneuvers in autonomous mode.

By passing these assessments, the TO demonstrates comprehension of all safety principles and the ability to skillfully operate an autonomous vehicle. Certification is valid for one year immediately following the completion of the recertification assessments.

Certification must be renewed annually in order for a Testing Operator to remain in compliance with Motional safety standards for safety-critical roles. This

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process consists of completing e-learning coursework, passing the e-learning exam, and in-vehicle evaluations.

The Operations Team will facilitate all recertification assessments. The Safety Team will audit all recertification results. All learning content is approved by the Learning & Development team to ensure International Accreditors for Continuing Education and Training (IACET) Accreditation standards.

If a Testing Operator does not complete annual recertification before expiration, they will not be permitted to operate vehicles in autonomous mode until they pass recertification again. If a Testing Operator does not meet the satisfactory scoring requirements set by Operations and Safety, they will receive performance coaching by their manager.

Performance Monitoring:

On an ongoing basis, Operations leadership monitors e-learning progress through automated reports within the LMS. Operations leadership will communicate and reinforce objectives and expectations that are related, but not limited to, vehicle behavior, safety performance, and announcements regarding daily operations.

Additionally, Operations will administer audits of randomly selected dashcam video footage to ensure TOs follow all required safety practices.

Performance Management:

TO performance reviews account for the following training-related activities:

- For new hires, successful completion of new hire training and certification
- Passing annual recertification assessments to Operations and Safety standards

In the event of a failed certification or recertification assessment, the Testing Operator (or Operations Team Member) will be held to the following corrective action plan:

- Failed Attempt #1:

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- Coaching by a Lead on the reason for failure. The team member may take a second attempt that time, or choose to schedule a retake.
- Failed Attempt #2:
 - Further performance coaching with Lead and Manager addressing the concerns or unsatisfactory behaviors. All coaching is documented in the performance points tracker.
- Failed Attempt #3:
 - No more future attempts are permitted. The team member is coached by the Leads and Supervisors once more, and then meets with the Operations Manager to review corrective action and/or a performance improvement plan.

Further, results from new hire training and annual recertification assessments can be referenced during annual reviews to show employee trends year over year.

E) Testing Protocols

As part of the Testing Operator role they are required to know and understand the testing mission before going out in the AV. This process is done in two main ways: an in-person stand up meeting with the Test Engineer/Specialist before departure and a review of test case notes and expected behaviors. Both situations are signed off on by the Testing Operator as being understood and questions asked.

Detail # 4: First Responders Interaction Plan

A First Responders Interaction Plan will be made available to the law enforcement agencies and other first responders (including fire departments and emergency medical personnel) which operate in the permitted testing areas in the Testing Locations Menu. The First Responder Interaction Plan should instruct those agencies on how to interact with the vehicle in emergency and traffic enforcement situations, including but not limited to:

- 1) Applicant's primary emergency contact information (including phone numbers) and secondary contact information if applicable**
- 2) Identifying the vehicle (make, model, color(s) and appearance, identifying decals or indicators)**
- 3) How to:**
 - a) Recognize whether the ADS is engaged, safely disengage the ADS, and detect and ensure that the ADS has actually been deactivated**
 - b) Immobilize or otherwise disable the vehicle to prevent movement or subsequent ignition of the vehicle**
 - c) Safely interact with electric, hybrid, or alternative fuel vehicles, when applicable**
 - d) Safely remove the vehicle from the roadway**
- 4) Any additional information as deemed necessary regarding hazardous conditions or public safety risks associated with the operation of the test vehicle**

The First Responder Interaction Plan shall be reviewed on a regular basis by the Applicant and revised and resubmitted at least annually, or as changes are needed.

The First Responder Interaction Plan will be made available by MassDOT to law enforcement agencies and other first responders, including fire department and emergency medical personnel.

A copy of the First Responder Interaction Plan must be carried in the approved test vehicle(s) at all times in the glove box or another conspicuous location.

The First Responder Incident Response Plan for our IONIQ 5 platform is attached to the end of this application as Exhibit A.

Detail # 5: Applicant's Voluntary Safety Self-Assessment

Attach a copy of the voluntary safety self-assessment in accordance with NHTSA's Automated Driving Systems 2.0 guidance, or similar documentation which addresses the safety issues contained therein.

Note: Applicants should not disclose any confidential information or other material considered to be trade secrets, as the applications are considered to be public records. The Massachusetts Public Records Law applies to records created by or in the custody of a state or local agency, board or other government entity. Every record that is made or received by a government entity or employee is presumed to be a public record unless a specific statutory exemption permits or requires it to be withheld in whole or in part. The exemptions are strictly and narrowly construed. More information on the Commonwealth's Public Records Law can be found on the [Secretary of the Commonwealth's website](#).

Motional's Voluntary Safety Self-Assessment [is accessible at this link](#) and in Exhibit D.

Detail # 6: Motor Vehicles in Testing Program

Attach a photocopy of the vehicle registration form for each Test Vehicle. If the Title number for the motor vehicle is not displayed on the registration itself, provide a photocopy of the Title or Certificate of Origin. Please note any exemptions by USDOT, EPA, or any other such exemptions for each vehicle, and provide a copy of such exemption, if available.

Additional vehicles may be added at any time after initial approval by sending the necessary information to: Sara.Lavoie@dot.state.ma.us.

Titles and Registrations for vehicles in our MA testing program are attached to the end of this document as Exhibit B.

Detail # 7: Drivers in Testing Program

Attach a photocopy of the current driver's license of each human operator who will be designated as a Test Driver to operate a test vehicle in Massachusetts by the Applicant. If the Applicant uses a driver who has been licensed in another state within the past year, it shall provide a copy of the license and a certified copy of the driving record (no more than 30 days old) of the driver.

Personal information will be protected from disclosure in accordance with the Driver's Privacy Protection Act and 18 U.S.C. § 2725.

Additional Test Drivers may be added at any time after initial approval by sending the necessary information to: Sara.Lavoie@dot.state.ma.us.

A list of our drivers in our testing program and their drivers' licenses are attached to the end of this document as Exhibit C.

Detail # 8: Insurance Requirements

Provide any insurance certificates and statements evidencing all insurance requirements listed in the Memorandum of Agreement.

Insurance certificate is attached in Exhibit E

Detail # 9: Additional Questions

Please provide answers to the following questions where possible. Responses will assist in the development of local and State policies pertaining to ADS. Please do not disclose any confidential business information or other sensitive proprietary content.

1) Please explain why the organization is applying to test in Massachusetts.

We are proud to be testing our AVs in Massachusetts, home of our corporate headquarters and over 300 employees. Our mission is to make driverless vehicles a safe, reliable, and accessible reality. In pursuit of this mission, we are building software and hardware to power fully driverless vehicles. Developing driverless technology requires testing in diverse real-world conditions. Massachusetts' mixed weather, road surfaces, and traffic patterns provide technical challenges that make it an attractive area for testing AVs.

Motional has deep roots in Boston. The Boston core engineering team started working together at MIT in 2005 as part of the DARPA Grand Challenge. This team went on to form nuTonomy in 2013. In 2017, Aptiv acquired nuTonomy. Since Motional launched as a joint venture, we have been expanding our Boston office, attracting engineers from around the globe as we rapidly increase our

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headcount. Furthermore, the world-leading educational institutions and workforce in Boston make it an attractive location to recruit talent.

2) Will the organizations' efforts create temporary or permanent employment in the Commonwealth?

Motional's Boston office is the company's corporate headquarters, with over 300 staff and growing. This office is focused on software development of all AV functionality, product analysis, and user experience testing. Solving these challenges requires a stable and growing engineering workforce of the highest caliber.

Beyond the functions within Motional, the AV technology we are developing is the catalyst for an entirely new industry ecosystem. As AV fleet sizes grow, so will the needs of other industry partners. It will require highly trained technicians to service vehicles, calibrate sensors, and more. Our perspective is that these functions may be done within our organization in the short term but will eventually require fleet servicing partners or owner-operators who will upskill staff or develop entirely new training programs.

3) Does the organization have a long-term vision of automated mobility? If so, what does that look like?

We develop Level 4 autonomous vehicles and supporting technology for ride-hail and delivery applications. We believe driverless technology can fundamentally improve road safety and improve mobility ecosystems worldwide. We have chosen to introduce our AVs through ride-hail partners as it offers a convenient and familiar channel for consumers to experience driverless technology for the first time. Through our partnerships with ride-hail networks, we have an opportunity to bring robotaxis to millions of riders as a safe, accessible, and reliable transportation choice.

4) Please explain how your organization attempts to address the priorities identified in the Regional Memorandum of Agreement for AV testing¹, with particular attention to the societal benefits enumerated.

One of the central priorities in the Regional Memorandum of Agreement for AV testing is safety. AVs have an unprecedented opportunity to reduce accidents caused by human error. To us, safety is not a competition, and we have contributed to several efforts to uplift safety across the industry. We committed substantial company brainpower to help develop Singapore's Technical Reference 68, including expertise on functional safety, cybersecurity, and AV decision-making architecture. We also released a white paper titled "Safety First for Automated Driving," in which we collaborated with a consortium of leading automotive companies. It lays out the best practices for building safe AVs and validating their safety. Safety is the central pillar of our culture, and it shows. We've driven over two million autonomous miles with zero at-fault incidents - all while being the only company in the world to have AVs deployed on both left-hand drive (LHD) and right-hand drive (RHD) roads.

As stated earlier, the business model we are striving towards is one of robotaxis. When it comes to lowering congestion, emissions, and total vehicle miles traveled, shared vehicles, rather than individually owned, will be crucial. An AV with a high quality of service that provides first- and last-mile connectivity to other transport modes can help entice people away from private vehicles and reduce congestion. Our current vehicle platform is a plug-in hybrid electric vehicle (PHEV), another critical factor in reducing emissions. Research by Motional's co-founder Prof. Emilio Frazzoli laid the groundwork for how all these components come together to benefit the transport system. In "Toward a Systematic Approach to the Design and Evaluation of Automated Mobility-on-Demand Systems: A Case Study in Singapore," Prof. Frazzoli simulates an AV system in Singapore that could serve the entire country's demand with 1/3rd of the vehicles at present. We are striving towards a future where robotaxis work in conjunction with public transportation and micro-mobility — fewer cars, with lower emissions traveling for shorter distances with the help of public transportation.

¹ <https://www.mass.gov/guides/testing-automated-driving-systems-in-massachusetts>

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Developing this technology with deep roots in Boston will have downstream impacts across the local economy. First, there will be spillover to local research institutions. Though ultimately unsuccessful in its bid, our 2019 USDOT grant application in collaboration with MIT, the City of Boston, MassDOT, and others is an excellent example of that spillover potential. Secondly, Boston remains one of our world-class technical centers and is Motional's headquarters. Solving the biggest challenges in mobility requires a workforce at the cutting edge - meaning great jobs within Massachusetts. Lastly, the development of AVs here seeds the beginning of an entirely new industry ecosystem to support it. We have already begun outreach to local technical schools to ensure the talent pipeline fills up early. For example, we have had preliminary discussions with the Benjamin Franklin Institute of Technology as they think about an updated automotive curriculum. We recommended a number of areas of focus that would be of value to Motional in addition to the growing field of companies needing technicians trained in Advanced Driver-Assistance Systems (ADAS) and electric vehicle servicing. Outside of Massachusetts, we have also worked with the Nevada Governor's Office of Economic Development on long term workforce planning.

From a sustainability perspective, Motional's all-electric IONIQ 5 robotaxis will help ride-hail networks meet their zero-emissions goals. Our all-electric fleets will also provide learnings about the impact of electric autonomous vehicles on charging infrastructure at scale.

It takes collaboration between the private and public sectors to ensure AVs deliver on their promise for safer, smarter, and more sustainable transportation. We applaud the government's leadership in developing the regional MOA and look forward to collaborating further on the future of transportation in Massachusetts.

List of Exhibits

Exhibit A: First Responder Interaction Plan

Exhibit B: Vehicles In Testing Program

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Exhibit C: Testing Operators & Drivers Licenses

Exhibit D: Motional's VSSA

Exhibit E: Certificate of Insurance

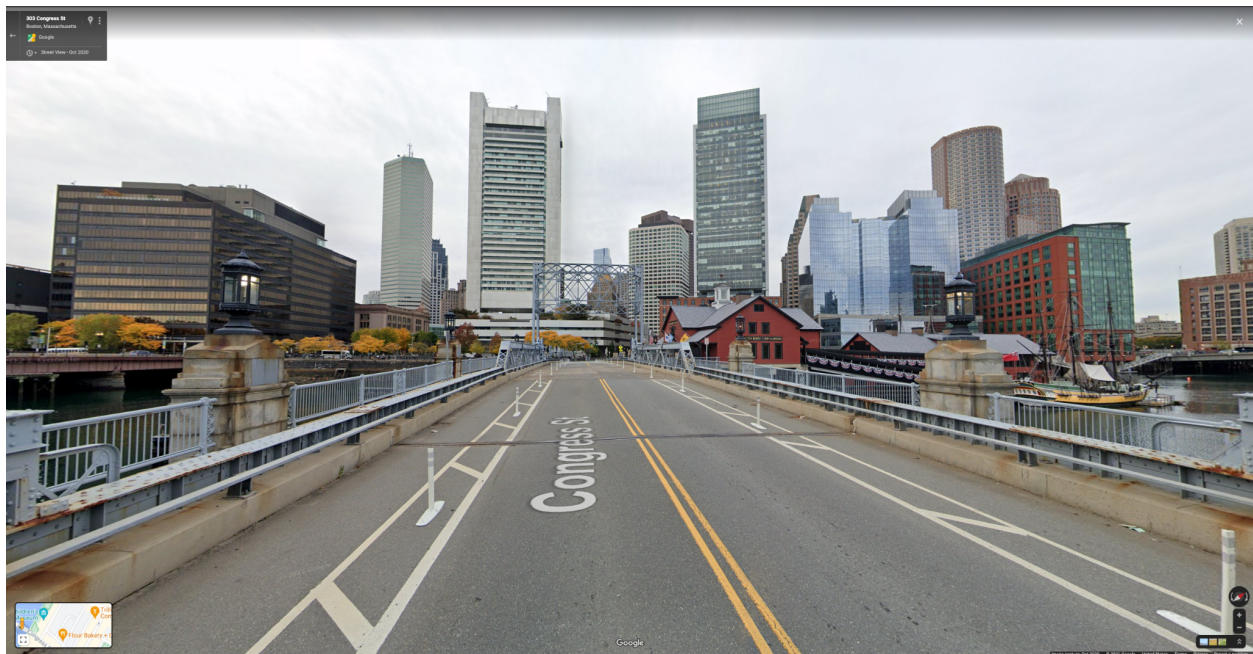
Exhibit F: Testing Plan

Exhibit F: Testing Plan

Motional requests permission to test our Autonomous Vehicles in the City of Boston. We currently have no requests to conduct pilots at this time. If we wish to expand our testing area or conduct pilots, we will request the appropriate permissions from MassDOT as well as participating municipalities and update this document accordingly.

Examples of roadways we intend to test on in Massachusetts:

Congress Street Bridge



Pier 4 Boulevard



Drydock Avenue



Examples of roadways we intend to test on in Nevada:

Paradise Road



Frank Sinatra Drive



South Bridge and Sahara Ave

