AUTONOMOUS VEHICLES: A PUBLIC REGULATORY POLICY GUIDE

With the introduction of autonomous vehicles, automation is poised to become a much larger part of our transportation environment. Much of the discussion to date has focused on the technology, its capabilities, and the perceived public benefits. However, many questions remain unanswered by industry, which has led to uncertainty within the public regulatory environment. To address this uncertainty, NSPE proposes the outcome-based standards below, based on careful consideration and deliberation, as a starting point for adopting standards that protect public safety.

This policy guide provides public policy decision makers, regulators, manufacturers, and others with guidelines to measure safety readiness of autonomous vehicles under consideration for deployment.

1. RISK ASSESSMENT

Autonomous vehicle manufacturers should adopt a risk assessment and/or hazard severity model. **What is an acceptable amount of risk?** In order for industry and the public to properly assess risk, manufacturers should be required to report **all** incidents involving autonomous vehicles. An industry standard for risk assessment needs to be established.

2. ETHICS COMPLIANCE DISCLOSURE

Autonomous vehicle manufacturers' **safety concerns** cannot, nor should, be limited solely to the vehicle's occupants. A human driver will assess the immediate environs to determine the best possible outcome for an operating action.

3. SELF-SUFFICIENCY

Autonomous vehicles should be able to **operate safely and correctly** without the support of additional public infrastructure and investment, such as dedicated AV lanes and vehicle-to-infrastructure investments.

4. ACCOUNTABILITY

Autonomous vehicles manufacturers should be **required** to maintain an expanded "black box" (event data recorder) of data inputs for post-incident evaluation and should include the following:

- Reference to a time standard so all recorded events refer to a known point in time.
- The service brake data event should also include braking intensity from 0 to 100%, not just ON/OFF.
- A series of recordings from the outside object detection sensors, both forward and lateral looking—invaluable information for accident reconstruction.
- Outside conditions (temperature, weather conditions, posted speed limits, and traffic intensity) should also be recorded.
- Any received driving condition alerts that may have been broadcast via the GPS or traffic control signals.
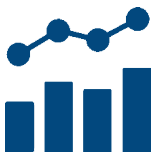
AUTONOMOUS VEHICLES:
A PUBLIC REGULATORY POLICY GUIDE

5. THIRD-PARTY VERIFICATION

Autonomous vehicle manufacturers should be required to demonstrate capability for safe driving before further expansion and rollout. Third-party verification should be performed by a **licensed professional engineer** or others who are appropriately qualified.

6. REDUNDANCY

Autonomous vehicle manufacturers should provide **back-up operating systems**. Redundancy can ensure that critical operating systems will function while maintaining passenger and occupant safety.

7. MAP STANDARDIZATION

Autonomous vehicle manufacturers should work toward a **standardized mapping system** that ensures the correct location of the vehicle and that provides necessary and timely changes to the system's maps.

8. SECURITY

Autonomous vehicle manufacturers should demonstrate, before widespread deployment, a certain level of security to **prevent jamming and hacking**.

9. TRAINING/OPERATIONAL LICENSING

Autonomous vehicle manufacturers should **provide training** and operational support beyond the regular driver's license, educating drivers about the limitations of self-guiding features.

10. MAINTAIN MANUAL CONTROLS

Manual driver controls should be maintained for autonomous vehicles for all levels of autonomy. Eliminating the ability of vehicle occupants to move the vehicle to a position of safety is counterintuitive to safety principles.

11. SAFETY FEATURES

The current level of automotive safety devices/features should be maintained. **Vehicle safety devices** and features should remain until sufficient historical data is compiled on the accident history and safety record of autonomous vehicles and can justify otherwise.

12. VEHICLE-TO-VEHICLE CONNECTIVITY

As part of autonomous vehicle operation and to enhance safety, **vehicle-to-vehicle connectivity** should be included as part of autonomous vehicle operation.

Licensed professional engineers should play a critical role as part of the autonomous vehicle design and manufacturing process because of the breadth and depth of the professional engineers' understanding of engineering issues as well as their obligation to hold paramount the public health, safety, and welfare.