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U.S. Department of Transportation
National Highway Traffic Safety Administration
Docket # NHTSA-2018-0092

Advance Notice of Proposed Rulemaking:
Pilot Program for Collaborative Research on Motor Vehicles with High or Full Driving Automation

Submitted By:

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TuSimple submits these comments to the National Highway Traffic Safety Administration (NHTSA) in response to the agency's advance notice of proposed rulemaking (ANPRM) for a *Pilot Program for Collaborative Research on Motor Vehicles with High or Full Driving Automation*.

TuSimple is working to bring to market an autonomous truck able to drive depot-to-depot– with the highest levels of safety.[1] TuSimple is addressing industry challenges including making the road a safer place, reducing overall operating/driving costs and carbon emissions as well as providing a solution to the industry's critical driver shortage.

TuSimple's perception system sees up to 1,000 meters[2] and provides a pixel-level interpretation of the surrounding environment, enabling the vehicle to locate itself within four inches of the road. TuSimple's technology design uses sensor fusion, but with a camera centric approach that functions-- rain or shine.[3]

[1] https://youtu.be/HnphFUHOoXE

[2] https://youtu.be/Wi8JcCcipK4

[3] https://youtu.be/teMXT-j6jns

TuSimple is headquartered in San Diego, with a testing and development facility in Tucson, Arizona. The company has been testing its Level 4 Class 8 autonomous trucks in Arizona for over a year and recently began generating revenue hauling freight for commercial customers in the state. Earlier this year, TuSimple announced[4] plans for further expansion with a projected total economic impact of $1.1 billion over the next five years. To support its growing development program, TuSimple projects it will create 500 new jobs across a variety of fields. By 2019, the company will expand its fleet to further validate the technology by hauling commercial goods within the logistics industry, generating data on millions of road miles.

TuSimple is currently working with local, state, and federal officials as well as public universities and non-profits to identify and resolve issues related to the testing and deployment of trucks equipped with Automated Driving Systems (ADS). TuSimple is committed to an open and collaborative relationship within our community and with our government partners. Safety is TuSimple's north-star and we operate everyday with that ethos in mind.

TuSimple is encouraged by NHTSTA's ANPRM and appreciates the ability to comment on this notice, however the pilot program being limited to light-duty vehicles is disappointing. We encourage NHTSA to consider partnering with the Federal Motor Carrier Safety Administration (FMCSA) on a future voluntary pilot program for commercial heavy-duty trucks.

Below are TuSimple's responses to select questions presented in the ANPRM:

Question 1: What potential factors should be considered in designing the structure of a pilot program that would enable the Agency to facilitate, monitor and learn from on-road research through the safe testing and eventual deployment of vehicles with high and full driving automation and associated equipment?

TuSimple believes that much can be learned from pilot programs of vehicles with high and full ADS. For commercial vehicles, TuSimple believes that testing the system with a trained, experienced, CDL-holding driver, running real revenue generating routes is vital to learning about the impact high and full ADS will have on the entire logistics eco-system. TuSimple's approach is that testing of ADS-equipped trucks involves more than simply evaluating the performance of the technology. We believe that testing of ADS-equipped trucks should also consider the impacts on other stakeholders, which will lead toward development of a complete self-driving truck that meets the needs of all interested parties. Following that approach, TuSimple is working with fleets, shippers, state and local law enforcement, universities, and non-profit partners on several different programs in Arizona. These stakeholders are all working together to learn from each other on the effect that trucks with ADS will have on highway operations, business operations, safety, enforcement, and emergency response. What the Arizona Department of Transportation (ADOT) is interested in learning is different, then our university partners interests, but the key is being flexible and open to collaboration among stakeholders. One example of an area we are working on in testing our vehicles in the real-world is addressing questions from law enforcement about the interaction of our truck with first responders and enforcement personnel. TuSimple is currently meeting and working with all the

[4] https://globenewswire.com/news-release/2018/09/12/1570063/0/en/Self-driving-Truck-Company-TuSimple-Announces-Expansion-in-Tucson-Arizona.html

interested law enforcement agencies in Arizona to understand each of their needs and concerns to prepare their agency for the future.

Question 2. If NHTSA were to create a pilot program, how long would there be a need for such a program? What number of vehicles should be involved? Should NHTSA encourage the conducting of research projects in multiple locations with different weather conditions, topographical features, traffic densities, etc.?

NHTSA should utilize willing industry and university partners to cover the broadest diversity of geographic, topographic, weather conditions, etc. possible. As NHTSA is aware, companies are developing ADS with different operational design domains (ODDs). While this provides NHTSA an opportunity to gather information in a variety of conditions and locations, not every condition/location will be appropriate for every ADS. Therefore, NHTSA should consider the ODD of the participating companies' ADS when identifying the locations and conditions for the pilot tests. As an example, TuSimple's current ODD is depot to depot, which includes highway and local driving in industrial areas. Our ODD also includes operation in high winds and rain.

Question 7: What types of performance measures should be considered to ensure safety while allowing for innovation of emerging technology in vehicles with high and full driving automation participating in a pilot program?

Companies designing ADS each take their own technological approach to solve the specific business use cases they have identified. TuSimple believes NHTSA should consider, technology-neutral, performance-based measures of safety that will be unique depending on the vehicle's intended ODD. For example, TuSimple's heavy-duty truck and trailer require our camera-based perception technology to see up to 1,000 meters. Due to the required longer stopping distances of heavy-duty trucks compared to smaller and lighter cars, TuSimple's 1,000-meter perception system provides the truck with sufficient time, looking 35 seconds ahead. For a comparison, FMCSA recommends[5] that commercial truck drivers look 15 seconds ahead, which is approximately 1/4 of a mile on the interstate and 1-1/2 blocks in the city. This increased perception distance provides additional time for the ADS to make driving decisions and take action, enabling safer lane changes and reducing the occurrence of hard-braking situations. TuSimple believes this perception range should be a necessary requirement for the safe deployment of autonomous trucks on our highways and local streets, but that this performance level should be evaluated in such a way to allow for flexibility in the choice of technology to accomplish it.

In conclusion, TuSimple supports the multi-modal approach taken by the U.S. Department of Transportation (USDOT) in *Preparing for the Future of Transportation: Automated Vehicles 3.0* (AV 3.0)[6], which addresses a broad range of issues for the safe testing and deployment of automated vehicles on U.S. roads. Voluntary pilot programs for collaborative research with USDOT would advance our collective understanding of the benefits and limitations of autonomous vehicles to support the safe integration of ADS-equipped vehicles into the nation's transportation system. We appreciate the open dialogue that all operating administrations within USDOT are having with stakeholders regarding ADS, and recommend that NHTSA consider holding workshops modeled after the Federal Highway Administration's *National Dialogue on Highway Automation* as they further develop their pilot program concept.

[5] https://www.fmcsa.dot.gov/safety/driver-safety/cmv-driving-tips-inadequate-surveillance
[6] https://www.transportation.gov/av/3

TuSimple is looking forward to working with the USDOT and other partners to bring this game-changing technology to market. If you have further questions or comments, please do not hesitate to contact me by email at robert.brown@tusimple.ai

Respectfully,

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