National Roadway Safety Strategy – ITS America Response

The U.S. Department of Transportation (USDOT) released its National Roadway Safety Strategy[1] (NRSS) in January 2022, adopting a Safe System Approach and describing major actions USDOT will take to meaningfully improve transportation safety in five key categories – safer people, safer roads, safer vehicles, safer speeds, and post-crash care. The Intelligent Transportation Society of America (ITS America) appreciates USDOT's focus on improving the safety of our nation's transportation system and supports many of the Department's planned actions described in the report. However, we also envision a greater role for transportation technology to play in improving the safety of our transportation system.

ITS America is the nation's leading advocate for the technological modernization of our transportation system by focusing on advancing research and deployment of intelligent transportation technology. Founded as an official advisory board on road technology to USDOT, ITS America represents state and city departments of transportation, transit agencies, metropolitan planning organizations, automotive manufacturers, technology companies, engineering firms, automotive suppliers, insurance companies, and research and academic universities. Our members come to one table – ITS America – to shape the next generation of transportation and infrastructure driven by intelligent transportation technologies.

ITS America's mission is to advance the research, development, and deployment of intelligent transportation technologies and solutions to save lives, improve mobility, promote sustainability, improve equity, and increase efficiency and productivity. Our focus is policy that accelerates the deployment of seamless mobility technology, connected and automated vehicle technologies, and smart infrastructure; policy that breathes new life into our transportation system by expanding investments in technologies that support smart communities; policy that encourages new models and modes of transportation, including micro-transit, ride-sourcing, carshare, bikeshare, micro-mobility, and unmanned systems; and policy that does all of this while making our transportation system safer, greener, and smarter. Investments in these technologies should also address issues of transportation equity, so everyone gains access to mobility and opportunity, and the valid concerns of the transportation workforce. However, our first priority has always been, and continues to be, safety.

The Roadway Safety Problem

Far too many individuals are injured or die on our nation's roadways – including an estimated 38,680 fatalities in 2020 – and that number continues to increase. In fact, over the first 9 months of 2021, the National Highway Traffic Safety Administration estimates there were 31,720 fatalities, a 12 percent increase over 2020. Disturbingly, pedestrians, bicyclists, and other vulnerable road users make up an increasing percentage of overall fatalities, and fatality risks increase for disadvantaged and minority populations.

We appreciate USDOT's acknowledgment that the "status quo is unacceptable"[2] and that these deaths are preventable. We agree that zero is the only acceptable number of deaths and serious injuries on our

[1] https://www.transportation.gov/sites/dot.gov/files/2022-02/USDOT-National-Roadway-Safety-Strategy.pdf (hereinafter NRSS).
[2] NRSS at ii.

nation's roadways, and we will continue our efforts to advance the development and deployment of transportation policies and technologies so that we can ultimately reach that number.

We also agree that many opportunities to improve safety will also address two other priorities for USDOT and ITS America – increasing equity and addressing climate issues. In addition to safety, these priorities permeate the work that we do at ITS America.

A Safe System Approach

In the NRSS, USDOT adopts a Safe System Approach as the guiding paradigm to address roadway safety, acknowledging both human mistakes and human vulnerability, while designing a redundant system to protect everyone. Notably, USDOT recognizes "the Safe System Approach as encompassing all the roadway safety interventions required to achieve the goal of zero fatalities,"[3] but fails to adequately incorporate deploying transportation technology into the NRSS, thereby excluding numerous safety benefits these technologies provide.

Specifically, the NRSS identifies a Safe System Approach that incorporates six principles: (1) death and serious injuries are unacceptable. (2) humans make mistakes, (3) humans are vulnerable, (4) responsibility is shared, (5) safety is proactive, and (6) redundancy is crucial. Some of these principles state obvious facts that we can all agree on, including crashes involving deaths and serious injuries should be eliminated, that a transportation system should be designed to accommodate human vulnerabilities, and that all stakeholders share in the responsibility of advancing safety on our roadways.

To address the other three principles – humans make mistakes, safety is proactive, and redundancy is crucial – transportation technology must be incorporated. Technology provides the opportunity to prevent or mitigate human mistakes by providing more complete information to drivers or taking corrective action when crashes are imminent. Technology is proactive and can be used to identify and address safety concerns before they arise, such as with digital twinning technologies and the use of artificial intelligence. Finally, technology can fill the critical need of redundancy as a fallback protection should education, roadway design, traffic regulation, and enforcement fail. Transportation technology is the digital layer of protection that provides first-level and redundant safety benefits by preventing and mitigating crashes, fatalities, and injuries, all while making our transportation system more equitable and sustainable.

The National Roadway Safety Strategy

USDOT identifies five complementary objectives within its NRSS: (1) Safer People, (2) Safer Roads, (3) Safer Vehicles, (4) Safer Speeds, and (5) Post-Crash Care. Transportation technology can contribute to enhancing safety within each of these five objectives. While USDOT has incorporated some transportation technologies, including Advanced Driver Assistance Systems (ADAS) such as Automatic Emergency Braking (AEB), it fails to consider several other important technologies that can help achieve our shared objectives.

[3] NRSS at 6.

Safer People

USDOT recognizes the need to "[e]ncourage safe, responsible behavior by people"[4] in the transportation system. While not the only, or even primary factor, in many fatal traffic crashes, the actions that people take directly influence safety outcomes on our roadways. USDOT rightly acknowledges that technology has a key role to play in developing ways to measure and address drug and alcohol impairment and distracted drivers. However, technology can play a greater role by providing drivers and other road users with critical information about roadway, traffic, and weather conditions before a user encounters them through the deployment of connected vehicles and infrastructure. Additionally, public education regarding the uses, differences, and driver responsibilities surrounding ADAS and Automated Driving Systems will enhance the safety benefit of those technologies while preventing misuse. Finally, the continued development of automated vehicles (AVs) and Automated Driving Systems (ADS) technologies provide an opportunity to remove driver behavior from the equation in some or all situations.

- The Tampa Hillsborough Expressway Authority (THEA) has been working as a Connected Vehicle (CV) pilot site since 2015, implementing real-time Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) communications. This included applications such as forward collision warning, red light violation warning, wrong way entry warning, emergency electronic brake light warning, and end of ramp deceleration warning. The program provided 14 alerts warning wrong-way drivers, helped drivers avoid 9 potential trolley crashes, and provided approximately 1,500 speed advisories per month.

- Wyoming's CV pilot program enables localized road condition information, such as fog or icy roads and high winds, to be broadcast from a roadside unit and received by connected vehicles. These alerts, which include work zone warnings, distress notifications, forward collision warnings, and spot weather impact warnings, serve to mitigate truck blow-overs along I-80 during harsh winter conditions and to prevent chain reaction pileups in low visibility conditions.

Safer Roads

USDOT identifies its Safer Roads objective as designing "roadway environments *to mitigate human mistakes* and account for injury tolerances, to encourage safer behaviors, and *to facilitate safe travel by the most vulnerable users*."[5] The NRSS focuses its discussion of Safer Roads on roadway design and emphasizes the implementation of Complete Streets policies that prioritize the safety, comfort, and connectivity to destinations for all users, including pedestrians, bicyclists, those who use wheelchairs and mobility devices, transit riders, micro-mobility users, shared ride services, motorists, and freight delivery vehicles.

We agree that the transportation system should be designed with all of these users in mind and believe that technology can help ensure that roads are safe for all users. Technology can certainly be harnessed to mitigate human mistakes, examples include existing ADAS features such as Automatic Emergency Braking, Lane Departure Warning, and Lane Keep Assist as well as CV technologies that can alert a driver

[4] NRSS at 11.
[5] NRSS at 11, emphasis added.

if another driver is likely to run a redlight, if a pedestrian is entering the crosswalk against a signal, or if a bicyclist is about to enter the roadway.

Additionally, transportation technologies can be deployed to facilitate safer travel by the most vulnerable users and support Vision Zero programs, including by providing data to help identify problematic intersections and better understand site-specific issues and contributing factors. Technology can also be used to ascertain the presence of bicyclists and pedestrians in the roadway.

- Law enforcement and traffic agencies in southern Nevada are using artificial intelligence (AI) technology from Waycare to position police and dynamic messaging signs. The year-long trials saw a 43 percent decrease in speeding drivers and 18 percent fewer crashes in the corridors of focus. The program included the collaboration of the Nevada Department of Public Safety (DPS) Highway Patrol division, Regional Transportation Commission (RTC) of southern Nevada, and the Nevada Department of Transportation. A cost-benefit analysis showed a 16-times return on the initial investment and more than $3 million in economic benefits and savings.

- The City of Bellevue, Washington partnered with private industry to install 360-degree, high-definition traffic cameras at a diverse group of intersections and to evaluate the collected data using proprietary AI software to identify traffic volumes, road user speeds, and near-crash traffic conflict indicators. The project collected around 5,000 hours of footage and 8.25 million road user observations, allowing for statistical relationships to be modeled that provided the ability to identify the most problematic intersections and better understand the nature of site-specific issues and contributing factors to crashes.

- Communities across the country, including Austin, Texas, and San Jose, California, are deploying Velodyne Lidar sensors, perception software, and real-time analytics at intersections to enhance vulnerable road user safety and further Vision Zero goals. The technology's high resolution, low latency, and nighttime performance, differentiates evidence-gathering from legacy systems to address safety and equity concerns with enhanced accuracy. For example, lidar can detect slow-moving or static objects on the roadway like humans or those with increased needs, particularly at night when most pedestrian fatalities occur, and provide the opportunity to extend crossing time for slower pedestrians. The technology also does not collect biometric data, meaning cities get rich traffic data without compromising privacy across the community. The real-time 3D mapping and traffic analytics like near-misses, road user types, red-light runners, and precise tracking, give cities data to understand problems on their roads and use evidence-based decision-making to address them.

- Adaptive traffic signal control (ATSC) systems coupled with digital twinning technology can test solutions and simulate different situations to improve the travel experience and safety in urban roadway networks. Beyond modelling and planning, digital twins of cities can also be used in traffic management. By combining traffic models with real-time traffic data, traffic operators get a strong tool to predict, optimize and control traffic and transport. If an accident happens, the system is able to give several options to possible actions such as road closure or detour, to reduce

negative impacts on the network. This improves traffic flow and capacity, but also helps to increase road safety and reduce emissions.

- Google is using a data-driven approach to help states and local governments assess risk and prioritize investment in infrastructure accordingly. Index scores are generated for an overall risk score and are also broken out by topic areas such as (1) climate risks (erosion, flood, fire, drought, etc.), (2) safety, and (3) equity, helping agencies break down silos and take a more integrated approach based on the desired impact and outcomes. The program uses satellite imagery and Google Earth data to assess climate risks which are then combined with transportation asset information such as road usage, traffic data, and conditions. The program also has safety use cases that bring in real-time traffic, weather, cameras, and incident information to identify patterns, such as identifying where excessive speeding is recurring and potential countermeasures. Another component allows state and local governments to better integrate equity considerations into decision making. Metrics help decisionmakers uncover, understand, and quantify disproportionate impacts on communities based on race, income, and other social and demographic factors on topics such as access to transportation, crashes and incidents, access to opportunity (fresh food, jobs, health, etc.), air quality, and climate impacts. This program helps communities answer questions about equity, safety, and climate impacts on road networks, bridges, and the built environment that allows them to make more informed, community-responsive decisions.

- Scooter companies have incorporated AI to evaluate whether, where, and for how long riders use scooters on sidewalks rather than roadways, which can be used by cities to evaluate infrastructure improvement needs and for individual rider education efforts to reduce the use of scooters on sidewalks and improve safety for pedestrians.

- In Houston, Texas, the TranStar online traffic management system alerts drivers in real-time regarding where flooding is likely occurring through the use of flood sensor data at 200 locations, allowing drivers to avoid problematic areas.

- Smart traffic signals can provide real-time data to infrastructure owners and operators to optimize traffic light control so that wait and travel times are reduced for all road users, reducing congestion which can increase safety. Additionally, data from thermal cameras, high-definition cameras, and wireless micro-radar sensors and determine the presence of pedestrians and bicyclists and be used to extend green phases for safe crossing.

Safer Vehicles

USDOT states that its objective for Safer Vehicles is to "[e]xpand the availability of vehicle systems and features that help to prevent crashes."[6] We agree that expanding the availability of ADAS technologies is key to improving the safety of vehicles. However, vehicle technology developments should not be limited

[6] NRSS at 11.

to these vehicle system features, and USDOT should also focus on incentivizing the *development* of ADAS and ADS technologies through robust research, pilot, and deployment efforts.

USDOT focuses much of its discussion on ADAS technologies, including Automatic Emergency Braking and Lane Departure Warning, but fails to adequately consider the promise of CV technology, V2V, V2I, and vehicle-to-pedestrian (V2P) applications. Further, while USDOT notes that it intends to require manufacturers to provide notification when there is a crash involving ADS, create a public database with this information, and timely investigate emerging vehicle safety issues arising from the deployment of new technologies, the Department does not identify how it will encourage the development and deployment of these technologies. Providing information to the public and investigating safety issues is important, but these must be coupled with an effort to educate the public on the anticipated safety benefits of these technologies and provide an environment that encourages the development and safe deployment of these technologies.

- ADAS technologies including collision avoidance, blind spot detection, and lane keep assist systems allow drivers to travel with an extra layer of support – providing critical alerts in time to avoid dangerous road situations or mistakes by the driver.

- CV technologies have numerous applications specifically designed to improve safety for bicyclists and pedestrians, two groups disproportionately impacted by recent increases in road fatalities.

- CV technologies can also enhance vehicle safety through the use of sensor data sharing messages (SDSM) and maneuver coordination messages (MCM), allowing vehicles to share their sensor data with other vehicles and providing for coordinated movement among vehicles during merging or at intersections.

Safer Speeds

The Department's objective for Safer Speeds includes promoting safer speeds "in all roadway environments through a combination of thoughtful, context-appropriate roadway design, targeted education and outreach campaigns, and enforcement."[7] USDOT notes that "[d]esign can help to make roads and streets 'self-enforcing,' offering drivers contextual encouragement – via lane width, intersection design, pedestrian and bicyclist infrastructure, and other features – to drive at safer speeds."[8] USDOT also notes that "temporary conditions may necessitate slower speeds"[9] and encourages the use of signage that permits variable speed limits and education on driving cautiously in inclement weather.

We agree that roadway design is an important factor in encouraging safe speeds and that roadway conditions are an important variable, but the deployment of technology should not be limited to variable speed limit signage. The roadway is not a static environment and drivers should be provided with relevant information concerning the roadway – including notification of high winds, icy conditions, traffic

[7] NRSS at 11.
[8] NRSS at 26.
[9] NRSS at 26.

congestion, and the presence of emergency responders. CV technologies have the capability to provide all of this information and more to drivers wherever they are on the roadway.

- CV technologies can provide significant information regarding road conditions and safe traveling speeds to drivers. These technologies can alert drivers to upcoming congestion or a traffic crash, roadway conditions such as wind and ice, and the presence of emergency responders and work zones, providing drivers with ample time to adjust their speed accordingly.

- ADAS technologies such as adaptive cruise control can automatically slow a vehicle when a vehicle in front of it is traveling at a slower speed or suddenly changes speeds.

- Companies, including Google, are using real-time data to understand patterns and proactively identify actions to take to mitigate safety risks caused by excessive speeding. Machine learning models using cameras and other sensors and predictive analytics provide information to local infrastructure operators to identify problematic speeding and to address it proactively, leading to faster safety outcomes.

- Red-light cameras and speed cameras can improve compliance with posted speed limits and other traffic laws.

Post-Crash Care

USDOT's objective for Post-Crash Care centers on expedient access to emergency medical care and creating a safe working environment for first responders and preventing secondary crashes. USDOT notes that the timing of the arrival of ambulances and emergency responders is a major factor in whether an injured person survives a crash and that transportation incidents, including crashes, are the second most common cause of death among both police officers and firefighters, and the leading cause of death among tow truck operators. The Department notes that 20 percent of crashes are secondary in nature, meaning they occur as a result of an earlier incident. USDOT's priorities include shortening ambulance on-scene response times and minimizing the exposure of first responders to surrounding traffic and the risk of secondary crashes.

While CV technology can significantly reduce or mitigate initial crashes, it can also improve post-crash care by reducing emergency response times and reducing the risk to emergency responders. Vehicle-to-Everything (V2X) technology benefits emergency response time by allowing for emergency response vehicle signal priority – changing traffic signals to hasten response times – and through V2V technology could prevent emergency response vehicles from crashing into one another or other vehicles on their way to a crash site. CV technology can also alert vehicles of response vehicles stopped on the roadway, providing drivers with sufficient notice to slow down and move over.

- CV technologies are poised to significantly improve emergency responder traffic safety as they rapidly approach emergency sites, primarily by providing applications like emergency vehicle preemption, which helps establish corridors for these vehicles to reach their destination. Already, states are working to make this possibility a reality. Georgia received an ATCMTD grant to deploy

V2I applications to provide coordinated, corridor-based signal timing preemption for emergency vehicles. This approach will assist emergency vehicles in traversing exit ramps and arterials in an efficient and safe manner. Roadside unit applications will establish communications between intersections to implement a traffic signal plan to improve pedestrian safety.

- In southern Nevada, through the deployment of Waycare's technology discussed above, RTC and its law enforcement partners have reduced response times to crashes on average by nine to ten minutes. The fast emergency crews arrive on scene, the fast vehicle occupants can receive assistance, ultimately mitigating the likelihood of injury leading to fatality.

Conclusion

Transportation technology has enormous potential to improve the safety of our transportation system, while also enhancing equity and climate goals. Consistent with the Safe System Approach, the deployment of transportation technologies can be complementary to other safety measures and provide needed redundancy to mitigate failures in the system. ITS America agrees with USDOT's "ultimate goal"[10] of zero roadway fatalities, and while we support many of the strategies and actions outlined in the NRSS, the failure to fully consider and incorporate transportation technology will necessarily limit the capability of the NRSS to deliver this goal. We are eager to continue to work with USDOT to identify how the development and deployment of transportation technologies can strengthen the NRSS and enhance the safety of our transportation system.

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[10] NRSS at 31.