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Summary Report

Submitted by (NHTSA, IFSTTAR and UNECE WP.1)

The document is the summary report of the workshop on “Governance of Traffic Safety in an Automated Vehicle Environment”. The event was co -sponsored by: the National Highway Traffic Safety Administration, the United Nations Economic Commission for Europe -Working Party on Road Traffic Safety, and the French Institute of Science and Technology for Transport, Development and Networks. It was conducted on June 28-29, 2017, at the Palais des Nations, Geneva, Switzerland.

Workshop on Governance of Traffic Safety in an Automated Vehicle Environment

Co-sponsored by:

the United Nations Economic Commission for Europe Working Party on Road Safety (UNECE WP.1), the National Highway Traffic Safety Administration (NHTSA), and the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR)

Conducted on June 28-29, 2017
at the Palais des Nations, Geneva, Switzerland

Summary Report

This publication is distributed through a collaboration among the sponsoring organizations in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the workshop participants and not necessarily those of the sponsors, the United Nations Economic Commission for Europe Working Party on Road Safety (UNECE WP.1), the National Highway Traffic Safety Administration (NHTSA), and the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR). The sponsors assume no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is because they are considered essential to the object of the publication and should not be construed as an endorsement.

Executive Summary

The United Nations Economic Commission for Europe Working Party on Road Safety (UNECE WP.1), the National Highway Traffic Safety Administration (NHTSA), and the French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR) cosponsored a workshop to continue a dialog about approaches for ensuring the safety of all road users in an environment that includes highly automated and self-driving vehicles. This workshop follows a similar event conducted at Stanford University in the United States in October 2016 which initiated the dialog and set the course for further deliberation.

The workshop was hosted by UNECE and conducted at the Palais des Nations in Geneva, Switzerland on June 28-29, 2017. Attending were approximately 100 professionals representing governments from around the world, United Nations standard-setting organizations, automotive and information technology industries and academic institutions.

The workshop began with an update of vehicle automation technology development and an overview of the status of preparations by public safety institutions to accommodate the unique needs and implications of automated vehicles along with a review of evidence of public interest and acceptance. The workshop went on to consider challenges and opportunities for optimizing the safety of traffic including highly automated vehicles from both the institutional and operational levels. A technology demonstration was also provided to familiarize attendees with recently introduced autonomous driving systems.

The intent of this workshop was not to reach agreement on the best safety assurance methods, but rather to provide an opportunity for open discussion of challenges and opportunities. The desire was to focus on issues surrounding the integration of highly automated vehicles in traffic and stimulate thought among a broad range of stakeholders on approaches for maximizing the safety of traffic in future years.

Workshop presentations were delivered by internationally-recognized experts in technology, public policy and safety assurance methods. Specific topics included the following:

- Update and Overview of Technology, Institutional Readiness and Accommodating Legislation
- Governance Methods: Challenges and Opportunities
- Considerations for Testing Automated Vehicles on Public Roads
- Consumer Education and Acceptance
- Opening and Closing Remarks Provided by the Workshop Sponsors

Workshop on Governance of Traffic Safety in an Automated Vehicle Environment

Co-sponsored by the United Nations Economic Commission for Europe Working Party on Road Safety (UNECE WP.1), the National Highway Traffic Safety Administration (NHTSA) and the French Institute for Science and Technology for Transport, Development and Networks (IFSTTAR)

Background

Why Have a Workshop?

Highly automated vehicles promise substantial safety benefits by displacing reliance on human driver performance. Human susceptibility to distraction, fatigue, impairment by alcohol and drugs, and other risk factors compromises safe driving performance and has been shown to be associated with a high proportion of crash deaths. Automated driving technology has yet to be perfected, but is developing rapidly and is likely to be widely available in coming decades.

Displacing human driver control with technology has far-reaching implications. While the most obvious challenge might be in perfecting the technology itself, there are also substantial challenges in accommodating highly automated vehicles with regard to drivers licensing, driver education, interaction with other road users, interaction with public safety officials, and many other issues related to safe integration with traffic.

These far-reaching issues affect a similarly far-ranging group of stakeholders. A dialog was started among government, industry and academic experts in October 2016 to share ideas regarding the role of government in providing safety assurance in an age of vehicle automation. That workshop, hosted by the Center for Automotive Research at Stanford University in the U.S., reviewed basic approaches to safety assurance, looking to aviation as a possible example, and considered implications for vehicle technology, human factors, research and collaboration. In conclusion, participants stressed the need for an ongoing discussion among stakeholders to facilitate safe and efficient accommodation of the safety benefits of vehicle automation. Proceedings of the October 2016 *Workshop on Governance of the Safety of Automated Vehicles* can be found in these locations:

<https://www.unece.org/fileadmin/DAM/trans/doc/2017/wp1/ECE-TRANS-WP1-2017-Informal-3e.pdf>

https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/12837-workshop_on_governance_of_automated_vehicles_03062017_final_version-tag.pdf

What was the Purpose?

This workshop extended the dialog started at the prior workshop and focused more specifically in two areas, safe integration of highly automated vehicles in traffic, and accommodation of automated vehicles in road safety legislation, including the Geneva Convention on Road Traffic. The purpose was to share ideas and information and enable stakeholders to make informed decisions on the many steps ahead, including topics for future research, content for educational materials, testing and deployment strategies and road user policies.

Who Participated?

Over 100 representatives from governments around the world, automotive and technology industries, academic & research institutions, and other stakeholders gathered at the United Nations Palais des Nations to continue the dialog on the role of governments in assuring the safety of road users in an automated vehicle environment. While the mix of professional affiliations was maintained from the October 2016 workshop, the venue at the Palais des Nations permitted the involvement of individuals from a complementary set of government agencies, institutions and corporations, and enriched the discussion with new insights and viewpoints.

How was it Conducted?

This workshop followed Chatham House Rules. A wide range of topics were covered by a series of presentations. Workshop participants were encouraged to ask questions and share perspectives. The workshop was not intended to produce consensus. Rather the event was conducted to facilitate an open and comprehensive dialogue on strategies to optimize the safety benefits of highly automated vehicles.

Following introductory comments, the first panel set the context for the discussion by providing an update on the status of technology development, institutional readiness and public understanding. The second panel addressed traditional government safety assurance roles and examples of current global best practices. The second panel focused on strategies for accommodating highly automated vehicles in traditional safety assurance methods. The third and fourth panels concerned safety issues regarding testing of highly automated vehicles on public roads and the need for educating road users about the operation, performance and predictability of automated vehicles in traffic.

Panel 1 | Framing the Governance Discussion: Overview: *Status of technology development, consumer understanding, and institutional readiness.*

Panel 2 | Challenges and Opportunities: *Potential regulatory challenges and solutions.*

Panel 3 | Status of Government Role in Automated Vehicle Testing on Public Roads: *Special considerations and approaches for ensuring safe and effective operational trials of highly automated vehicles.*

Panel 4 | Consumer Education and Acceptance: *Needs for driver training and education of all road users.*

Technology Demonstrations: In addition to the panel discussions, a special demonstration of automated vehicle technology was provided for workshop attendees including an experience with remote parking and lane keeping assistance technologies.

Opening Remarks and Introduction

Leaders from the sponsoring organizations - UNECE WP.1, NHTSA, and IFSTTAR - welcomed participants and provided foundational remarks that established a context for the workshop deliberations. Key points included:

- There is a critical need for ongoing collaboration among stakeholders during this period of transformational change in our transportation system. The public and private sectors must share information and work together through forums such as the UNECE to develop techniques for providing our citizens the safety assurance they expect when highly automated vehicles begin to be used on our roadways.
- Vehicle automation offers tremendous potential for reducing the heavy burden that motor vehicle crashes now place on societies around the world. However, to realize that potential such transformational change needs to be introduced in a reasonable and coordinated manner. Consideration should be given to the appropriateness of traditional governance methods and changes made where necessary to accommodate the changing transportation system.
- Accommodations in governance techniques should be based as much as possible on data and scientific investigation and continually monitored and improved as experience with new technologies accumulates.
- The open and frank exchange of information and viewpoints in this workshop and similar forums is essential for efficient and effective progress in realizing the safety benefits of advanced technologies.

Panel 1 | Framing the Governance Discussion: Overview:

The first panel focused on the status of several essential elements of the pending transformation of our transportation system - technology development, consumer understanding and institutional readiness.

Advanced driver assistance systems are now on the market in locations around the world. Blind Spot Monitoring, Lane Keeping Assistance, Adaptive Cruise Control and Parking Assist technologies are among the first automated functions to be introduced to consumers. Meanwhile, technology developers are actively engaged in testing further advancements including full automation and expanded connectivity.

While technology is rapidly advancing, public awareness and understanding may be lagging behind. Surveys indicate that consumers are interested in the convenience and other benefits of vehicle automation, but public comprehension of the full range of implications of self-driving cars is just emerging. Indeed the extent of the social implications of automated driving reaches far beyond the traditional concerns of Ministries of Transport. The effects on mobility, the economy, employment, infrastructure and urban design, and quality of life, are not yet fully understood even by experts. Clearly, groups such as Working Party 1 have an important role in synthesizing information regarding these implications and identifying approaches for educating the public.

Governments are looking ahead to the introduction of self-driving cars and considering changes that may be necessary in safety assurance and administrative functions. Responsibilities for developing vehicle safety standards, monitoring safety performance, setting vehicle registration requirements, conducting safety inspections and establishing driver licensing criteria, are addressed in a variety of methods among nations, so a wide variety of professional groups and levels of government are currently engaged in discussions about accommodating automated vehicles.

Integrating vehicles with high levels of automation will require changes in the legal framework of many nations. Currently, governments are pursuing a range of approaches to adjust their legal framework with regard to issues such as vehicle safety standards, traffic code, liability and insurance. Consistency in such legal framework would be desirable for efficiency of technology deployment and to foster cross-border

transportation, however the ideal balance between consistency and accommodation of differences in national needs has yet to be determined. Identifying this balance point and fostering the ideal combination of consistency and flexibility is another important role for the UNECE Working Parties.

Panel 2 | Challenges and Opportunities:

The second panel focused more specifically on governmental safety assurance methods and approaches for accommodating vehicles with high levels of automation.

Some governments have taken a close look at existing regulations to determine how they might affect the introduction of highly automated vehicles. If an automated driving system is considered to be an acceptable substitute for a human driver - at least in some circumstances - then one view is that there may be few remaining impediments for a self-driving vehicle to comply with safety standards, so long as that vehicle is of conventional design in other respects. However if a self-driving vehicle substantially differs from conventional practice - for example in cabin layout or in elimination of manual controls - then existing safety standards may pose significant barriers to introduction. However, such analyses are obviously dependent on the specific national or international safety standards under consideration and on the approach taken in interpretation.

With regard to international standards, the UNECE Working Party 1, the Global Forum for Road Traffic Safety, and Working Party 29, the World Forum for the Harmonization of Vehicle Regulations, are working to address barriers to the safe accommodation of highly automated vehicles. The two Working Parties share a common vision and are pursuing coordinated efforts to address issues concerning vehicle design and performance and integration of such vehicles in road traffic systems.

Both Working Party 1 and Working Party 29 face substantial challenges in their work on highly automated vehicles. The range of new automation technologies under development promises tremendous safety benefit but brings concerns that have never been faced in the vehicle safety context, such as cyber security, as well as issues that will come about as a result of mixing highly automated vehicles with conventional driver-operated vehicles and vulnerable road users in traffic. A serious challenge for both Working Parties is the speed at which new technologies are developing and the ability of traditional regulatory processes for keeping pace with the change.

Working Party 1 is considering the development of non-binding guidance regarding the integration of highly automated vehicles in traffic as a way of providing useful input on safety issues for governments. Such non-binding guidance could react more quickly to technological advances than could changes to binding legal instruments and could serve to facilitate consistency of international practice in this area.

Interlude:

As a transition to the technology demonstrations which concluded the first day of the workshop, representatives of several international organizations representing governments, industry and road users provided viewpoints on the potential benefits of vehicle automation and important factors regarding the development and integration of these technologies in traffic.

Key themes expressed by these organizations included the need for international harmonization and consistency in vehicle technology, connectivity, institutional accommodation, and in integration in traffic. The need for an ongoing commitment to consumer education was also stressed.

Panel 3 | Status of Government Role in Automated Vehicle Testing on Public Roads:

The third panel examined issues surrounding an important near-term topic facing many governments around the world, accommodating the development and on-road testing of highly automated vehicles while assuring acceptable levels of safety for all road users.

A number of nations have taken steps to allow testing of vehicles with high levels of automation on public roads. These actions typically involve a set of criteria that focus on preparations and precautions taken by the technology developer prior to on-road testing, conditions for operation on public roads, and monitoring and reporting of vehicle performance and any safety incidents.

With regard to preparations and precautions, some governments have required that developers perform extensive laboratory and track testing to prove safe performance before allowing vehicles on public roads. For on-road testing, governments have required fail-safe measures such as a trained driver ready to take control at any time, and for monitoring safe performance developers have been required to take steps such as recording and reporting near misses, violations of traffic code and failures of operational software.

The success of testing programs are important not only for technical development but also for public confidence. At least one testing program is designed to engage members of the public, allowing them to experience highly automated vehicles and provide feedback on their confidence in the system and satisfaction with its operation.

Panel 4 | Consumer Education and Acceptance:

The final workshop panel addressed needs for educating the public about highly automated vehicles, with consideration given both to drivers of these vehicles and to other road users who may interact with these vehicles in traffic.

With regard to drivers, steps are already being taken to educate users of vehicles with automated systems such as automatic emergency braking, lane departure warning, blind spot warning and adaptive cruise control. Educational materials have been developed and consumer outreach is being conducted through a variety of methods including videos that are specific to a vehicle and integrated in the vehicle system so that drivers can be trained while seated in the vehicle in the driveway. Other more generalized materials are available online.

As automated systems become more complex and prevalent, the operation of these vehicles may become sufficiently specialized to justify a dedicated license. Driver licensing agencies in several nations are studying this situation and considering approaches for structuring licensing requirements and the types of competence that might need to be demonstrated at each license level. Since the configurations of commercialized highly automated vehicles has yet to be determined, consideration of licensing requirements is in early stages. However licensing agencies recognize that they need to examine options and be ready to move quickly when technologies are ready for the marketplace.

Research is underway to investigate the interaction of highly automated vehicles with other road users. Driverless vehicles could offer a range of safety benefits, but there is concern that in some cases the lack of a driver may prevent the types of road user communication that is necessary for safety in locations such as intersections and parking lots. Pedestrians and bicyclists commonly use eye contact with drivers as a means for judging whether it is safe to move in front of a vehicle in these situations. Without a driver, some other means may be needed to communicate the intentions of the vehicle.

Summary and Closing

In closing remarks, spokespersons from the three sponsoring organizations reflected on the potential social benefits of highly automated vehicles, the wide range of issues that must be addressed before such benefits can be realized, and the role of governments, industry, academia and others in identifying strategies for resolving these concerns. Technology is developing at a rapid pace and it is important that the associated social benefits be realized as quickly as possible - commensurate with safe and orderly deployment.

Integrating highly automated vehicles in traffic has far-reaching implications - technical, institutional, and social. Successful deployment of this technology requires that the full range of these implications be kept in sight and that necessary accommodations are carefully considered and implemented.

Workshops such as this one - and the previous event held on the Stanford University Campus in October 2016 - are essential to keep key stakeholders informed of contemporary thought, activities and progress. Only through such ongoing communication can government, industry, academia and other partners move efficiently towards resolution of barriers and successful deployment.

Further information on this workshop, including the Agenda and presentations, is available on the UNECE website:

https://www.unece.org/trans/roadsafe/automated_vehicles_workshop_geneva_2017.html