



Insuring Autonomy: How auto insurance can adapt to changing risks

JULY 2018

CONTENTS

1

Overview: The autonomous vehicle (AV) world
today and tomorrow

5

Auto insurance can – and will – meet society's
needs in an AV world

10

Critical insurance-related components
of an AV regulatory scheme

17

Conclusion

EXECUTIVE SUMMARY

Autonomous vehicles – or “AVs” – are a growing presence on American roadways, and with them come several significant policy questions and challenges. It will be important to address an ever-increasing AV world in a comprehensive manner that spurs innovation, increases public safety, provides peace of mind and protects American drivers and consumers. Travelers believes that the auto insurance industry should – and will – play a critical role, as lawmakers, regulators and society understand the new AV world. **This white paper outlines Travelers’ perspective and recommendations on these important public policy issues.**

Travelers believes that AVs ultimately will benefit society by reducing the number of accidents, injuries and lives lost. As people transition to using AVs, Travelers supports all measures that help ensure the safety of our roadways for individuals and property. However, there are significant uncertainties associated with AVs. For example, how long will it take to transition from our current state to a fully AV world? How long will it take for the anticipated benefits of AVs to be fully realized? What unintended consequences and disruptions will arise during the long transition?

When it comes to insuring AVs, Travelers believes that leveraging the existing automobile insurance structure, both commercial and personal, is the best method for compensating crash victims quickly and efficiently – now and in the future. The current insurance structure is already designed to adapt to evolving risk environments and would minimize regulatory uncertainty, market disruptions and consumer confusion.

Continuing to rely on auto insurance for coverage – regardless of vehicle type – will also help to ensure consistency during the long period in which AVs and driver-operated vehicles share the road. And regardless of whether a vehicle is autonomous or driver operated, auto insurance offers vehicle owners the most peace of mind when it comes to common concerns such as weather or theft.

To ensure that auto insurance continues to be the primary compensation method, any proposed legal and regulatory framework governing the use of AVs must include provisions specifically related to auto insurance. This means that vehicle owners should be required to purchase and maintain adequate insurance for their AV, whether it is a personal, ride-share or company-owned vehicle. And, coverage limits should be high enough to account for more expensive technology in AVs.

The insurance industry also should play a central role in AV policymaking and stakeholder discussions. Local, state and federal lawmakers and regulators must coordinate – and seek input from all relevant stakeholders – to ensure a consistent, rational regulatory framework that addresses all potential issues. Travelers would support the development of a model state law relating to AV insurance that builds on the current state-based regulatory and oversight structure for auto insurance.

As a longtime leader and innovator in both commercial and personal auto insurance, Travelers is well positioned to contribute to these discussions. We support – and are ready to help create – a nongovernment stakeholder coalition to make recommendations on insurance-related AV issues. Insurers also have extensive consumer communication programs and can help facilitate education on AV safety.

To this end, the following pages of this paper address:

- (1) The current state of the AV market, projections for future development and early policy responses.
 - (2) How auto insurance can meet society’s needs in an AV world.
 - (3) Specific insurance-related recommendations for an AV legal and regulatory structure.
-

OVERVIEW:

THE AUTONOMOUS VEHICLE (AV) WORLD TODAY AND TOMORROW

Using the levels of vehicle automation as defined by the Society of Automotive Engineers (SAE), the most advanced driver-operated AVs on the road today are considered Level 2, or “partial automation” vehicles. Level 2 vehicles can perform some driving functions, such as maintaining speed, following distance, steering, lane changes, etc., on their own for a short time. However, the driver is still in charge of actively monitoring the environment and controlling the car.¹ Vehicles with autonomy Levels 3 through 5 – where the *vehicle* takes over more and more of the driving tasks and responsibility – are fast approaching. By the time we reach Levels 4 (where manual operation can still be re-engaged) and 5 (fully automated), AVs will execute all driving functions without driver participation under certain roadway and environmental conditions for Level 4 vehicles, and in all conditions for Level 5 vehicles.

Cities across the country are embracing the AV wave and its opportunities for public transit, traffic control, improved safety, ride-sharing and other benefits.



Not surprisingly, the AV business is attracting significant investment from traditional auto manufacturers and technology companies.

By 2021, it is expected that Audi, BMW, Ford, GM, VW, Volvo, Tesla, Uber, Lyft, Google and Apple^{11, 12} will participate in the AV ecosystem in some fashion. Interestingly, a September 2016 Morgan Stanley and Boston Consulting Group Blue Paper reported that 54 percent of consumers were very open to riding in an AV and 52 percent said they would consider buying one.¹³

The data gathered so far, while limited, indicate that AVs are no more dangerous (and potentially safer) than human-controlled vehicles. For example, according to a study by the Insurance Institute for Highway Safety, Google's nearly 60 driverless vehicles, which have covered more than two million miles, have been involved in fewer than two dozen collisions, none of which were caused by AV system failure.¹⁴ In fact, the crash rate for Google's cars in autonomous mode is lower than the police-reported crash rate in the testing area (Mountain View, California, before 2016). However, the crash rate for Google's cars in autonomous mode is comparable to the statewide rate in California. Similarly, an October 2015 University of Michigan study found that self-driving vehicles involved in crashes were not at fault for any of the incidents.¹⁵

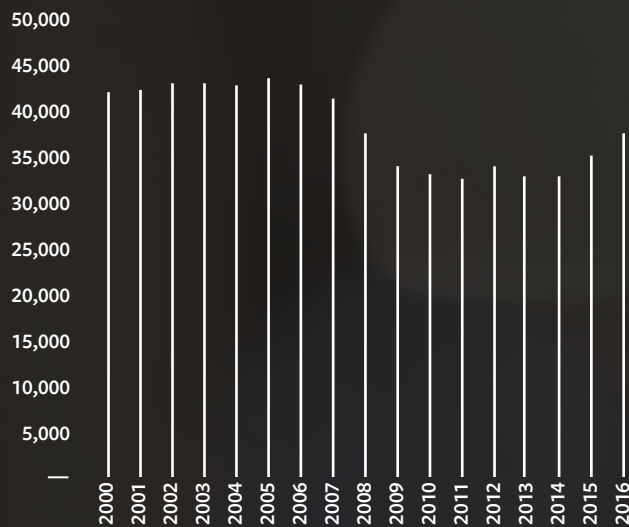
Even though there is potential for improved safety, recent collisions are a reminder of how much more there is to learn and test regarding AVs. In March 2018, there were two fatal AV-related crashes in the U.S.: one involving an Uber vehicle that was testing its autonomous mode in Tempe, Arizona; and one involving a Tesla Model X that had autopilot engaged in Mountain View, California (*Note: Tesla's Autopilot is only Level 2, and thus not autonomous*).^{16, 17} While these collisions may have resulted from variables outside of autonomous technology, it is crucial to conduct additional analysis to determine their root causes.

54% of consumers were very open to riding in an AV



52% of consumers said they would consider buying one



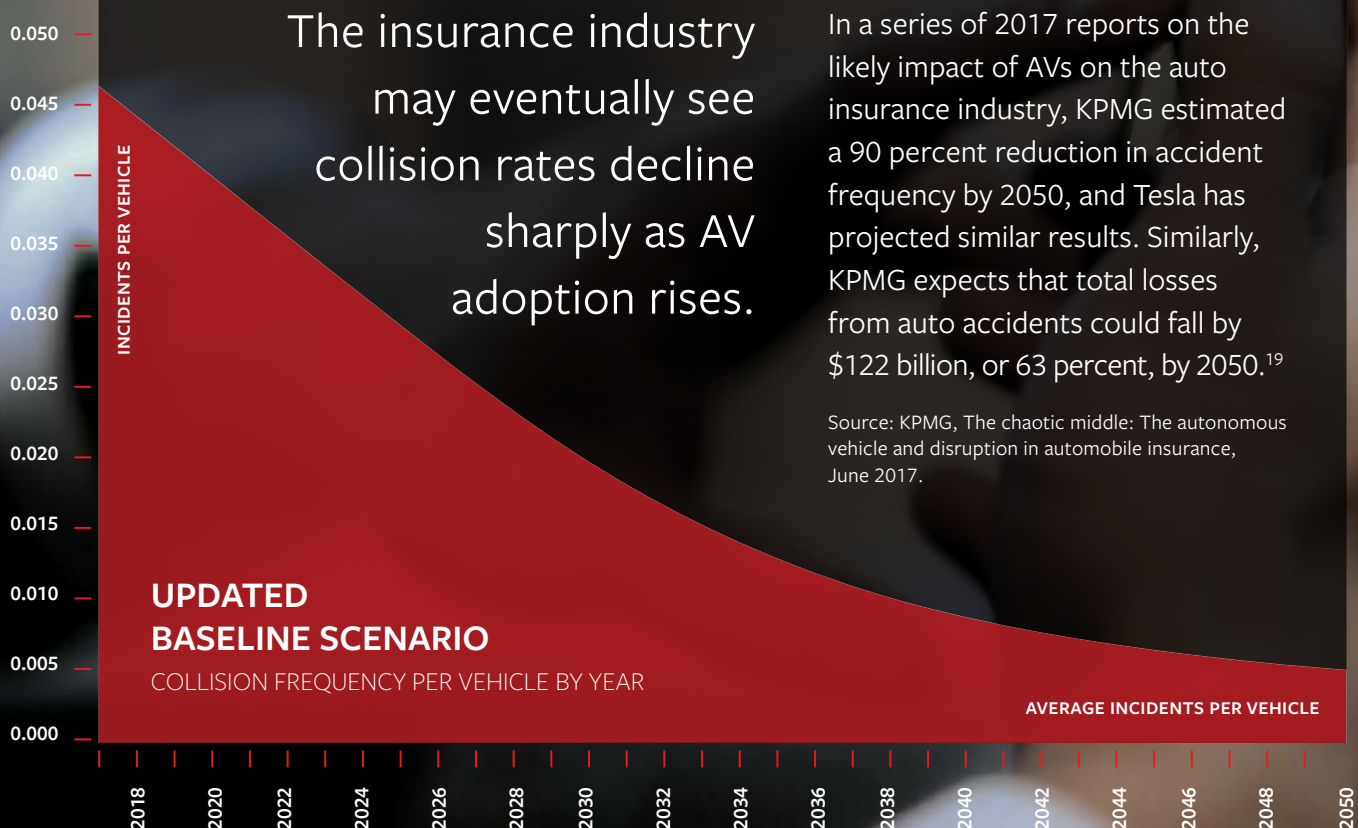


TOTAL U.S. HIGHWAY FATALITIES

BY YEAR

The Bureau of Transportation Statistics reports that there were 37,461 motor vehicle fatalities in the U.S. in 2016 alone.¹⁸

And highway traffic deaths have been on the rise. Travelers and others believe this may be attributable in part to distracted driving related to technology – an issue that may take on more recognition and importance as new AV technologies are rolled out to the public.



The insurance industry may eventually see collision rates decline sharply as AV adoption rises.

In a series of 2017 reports on the likely impact of AVs on the auto insurance industry, KPMG estimated a 90 percent reduction in accident frequency by 2050, and Tesla has projected similar results. Similarly, KPMG expects that total losses from auto accidents could fall by \$122 billion, or 63 percent, by 2050.¹⁹

Source: KPMG, The chaotic middle: The autonomous vehicle and disruption in automobile insurance, June 2017.

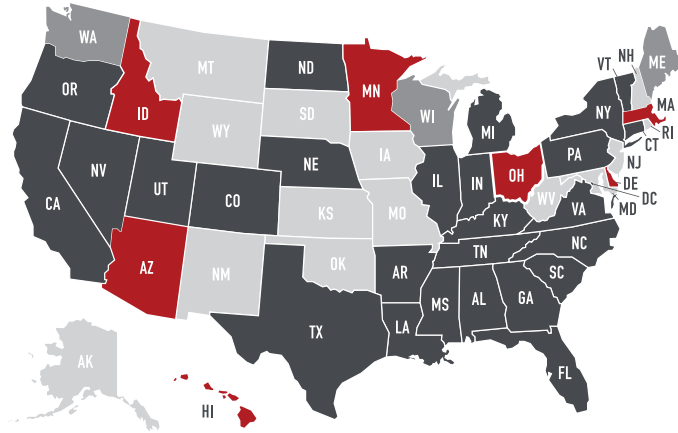
UPDATED BASELINE SCENARIO

COLLISION FREQUENCY PER VEHICLE BY YEAR

AVERAGE INCIDENTS PER VEHICLE

STATES WITH ENHANCED AUTONOMOUS VEHICLE LEGISLATION

- Enacted legislation
- Executive order
- Both
- None



Source: National Conference of State Legislatures

Although some experts predict that market saturation for fully autonomous vehicles may not occur for a few more decades, the market is clearly moving in that direction, and policy and regulatory regimes (along with industries like insurance) must adapt now. **According to the National Conference of State Legislatures, as of June 2018, 29 states and the District of Columbia have already passed some form of AV legislation. Ten other states have executive orders in place regarding AVs.**²⁰ However, state laws, which vary in their content, do not provide comprehensive AV regulatory regimes (e.g., some authorize operation of AVs; some promote and/or liberalize the requirements for AV testing; and others direct further study on how best to safely deploy AV technology on public roadways).

To date, only a few states have begun to address insurance-specific issues with respect to AVs, and those are focused on AV testing requirements. Meanwhile, the National Association of Insurance Commissioners (NAIC) Innovation and Technology Executive Committee Task Force adopted a charge to examine regulatory issues raised by AVs and consider developing recommendations and/or a model law for revising state insurance regulatory frameworks.²¹ Importantly, a 2016 study sponsored by the NAIC acknowledges that governments are already in a reactive position because AV technology is outpacing the development of laws and regulations that will ultimately govern that technology.²²

In this policy arena, early state-level movement underscores the need for a comprehensive, rational and uniform AV regulatory structure (recognizing state law likely will continue to govern both insurance and any compensation/liability system). For the reasons discussed on the following pages, such a structure should explicitly address insurance-specific issues and needs in the new AV landscape, which will be vital to ensuring a fair and efficient compensation scheme.

AUTO INSURANCE CAN – AND WILL – MEET **SOCIETY’S NEEDS IN AN AV WORLD**

Travelers believes auto insurance is best suited to address the compensation issues (e.g., bodily injury, property damage, cyber incidents) arising from the emerging AV world.

The following section discusses some of the major advantages of using the current insurance structure, versus alternative models (e.g., product liability), as the primary compensation method.

Auto insurance compensates victims quickly, fairly and efficiently, especially when compared to other risk transfer mechanisms.

Leveraging the current auto insurance structure as the primary risk transfer mechanism in a new AV world allows for speed, fairness and efficiency from the consumer’s perspective. The existing insurance structure is designed to – and indeed does – make vehicle owners whole and quickly and efficiently compensate accident victims for both bodily injury and property damage. In addition, most vehicle owners are familiar and comfortable with the existing insurance structure (e.g., purchasing coverage, having a basic understanding of coverage and policy documents, filing claims), and know how to take advantage of its benefits.

Moreover, the existing auto insurance structure can adapt more effectively than alternative structures to the evolving regulatory and legal environment by creating or enhancing insurance products. Given auto insurers' deep understanding of compensation systems, they are uniquely positioned to assist policymakers in developing or modifying such systems.

While there has not been widespread attention paid to how liability and compensation will be addressed as AVs multiply, product liability has been raised as the inevitable default option. That presumption should be challenged.

Unlike auto insurance, alternative risk transfer mechanisms like product liability are not structured to be primary, comprehensive solutions. A product liability-type regime for AVs – in lieu of, or with primacy over, the current auto insurance structure – could force consumers and victims to pursue complex, lengthy lawsuits to seek compensation. Such suits involve intensive and drawn-out investigative and evidentiary hurdles before anyone sees a day in court. Further, the product liability legal and regulatory environment is ill-fitted for handling auto collisions – the sheer number of discrete incidents would bog down court systems and significantly delay compensation. Victim compensation, if it happens at all, could take years.

The Takata air bag case is an example of the limitations of product liability in compensating victims. It has taken well over a decade for this case to proceed through the report filing, regulatory investigation, recall and compensation phases of the product defect regime that governs automakers and equipment manufacturers. Some auto companies have settled with consumers, but others are still embroiled in litigation – a particularly striking fact given that the initial product problems and driver injuries occurred in 2004.

Notably, and not surprisingly, the primary risk transfer and compensation mechanism for even more sophisticated modes of transportation (e.g., trains, airplanes, boats) goes beyond product liability and is based upon insurance. It makes sense – for consumers, businesses and regulators – for AVs to follow suit.

Using existing auto insurance systems minimizes consumer confusion, regulatory uncertainty and market disruptions.

Fundamentally, there is a high level of certainty and stability – for consumers, businesses, regulators and legal systems – in the current auto insurance structure. For example, we generally know that all vehicles and drivers are covered with some liability protection whether through insurance (the case with the vast majority of drivers); bonds or cash deposits in place of traditional insurance; or proof of ability to pay for an at-fault accident (e.g., in New Hampshire). And auto insurance has a robust legal and regulatory infrastructure with proper, comprehensive consumer protections in place to govern insurance providers and policyholders.



Additionally, auto insurance industry distribution systems are already in place and will evolve to accommodate new technologies and risks. Pricing and underwriting can – and likely will – shift to include both driver-based and vehicle-based systems. This will allow insurers to play their traditional role in risk mitigation by sending pricing signals vis-à-vis premium differentiation among covered autos to encourage AV technological improvements. Given the technology and data capture that is occurring in real time, policies addressing data sharing will need to be implemented to help ensure that premiums are appropriately matched to exposures. Further, AVs are sure to present new risks and liabilities (e.g., cybersecurity threats), which can be addressed by a new generation of insurance products.



Importantly, during the long period in which AVs and non-AVs will likely be sharing the road, auto insurance systems must – and will – be able to accommodate and adequately address both types of vehicles.

Importantly, during the long period in which AVs and non-AVs will likely be sharing the road, auto insurance systems must – and will – be able to accommodate and adequately address both types of vehicles. During this important transition period, a thoughtful compensation system is needed to prevent consumers from becoming mired in lengthy and expensive legal and technical disputes as to whether human error or technological malfunction caused any particular collision. Significantly, the lack of a timely and efficient compensation system will also stymie the adoption of AVs. Consistency in delivery, customer experience and expectations, with clear “rules of the road” (e.g., regulatory oversight, legal requirements), are vital to a rational risk transfer regime. If AVs and non-AVs are governed by different primary insurance structures or different liability standards, the resulting consumer confusion and regulatory/enforcement uncertainty will increase expenses associated with contentious liability determinations and market disruptions. Dividing the market in such a way would create a veritable patchwork on the roadways with respect to who is covered, for what, and under which regulatory and legal framework.

Moreover, if separate compensation and liability structures govern and/or have primacy over different types of vehicles and their owners, questions and uncertainty will arise around issues such as appropriate forum, liability and evidentiary standards, and the application of various no-fault-type systems.

There are other reasons as well. Today, insurers compensate accident victims for personal injuries and property damage and then, if appropriate, seek to recover those payments from vehicle manufacturers if some defect caused the loss. This process is called subrogation. These product liability claims can be complex and expensive. Potential product liability claims involving AVs could involve additional complexity and related cost. Creating a system that prioritizes compensation over resolving whether an AV was defective provides the most consistency and certainty to consumers, and leverages the existing legal and regulatory frameworks that have routinely adapted to technological advances.

■ Auto insurance will have an important role to play, regardless.

AV owners will still need coverage for non-collision-related incidents such as weather and theft.

Even with fully autonomous vehicles, human involvement will not disappear. Individuals will still need insurance as owners of fleets, personal or ride-share vehicles. In the foreseeable future, for vehicles with some driver involvement, liability for accidents remains an issue. And as noted previously, as increasingly distracting technologies are employed in Levels 2-4 vehicles, liability insurance may become even more important.

Drivers will also always have insurance needs that go beyond liability. Vehicle maintenance by owners (e.g., getting tires and brakes fixed, installing technology/software updates, sensor maintenance) entails personal responsibility and liability, which is properly addressed through insurance. Further, AV owners will still need coverage for non-collision-related incidents such as theft and weather damage. Product liability simply does not cover the entirety of essential coverage areas related to vehicle operation and ownership.

Finally, AV owners – like all other vehicle owners – want peace of mind that they have protection to cover the costs of unforeseen events. Auto insurance provides consumers with 24/7 protection, unlike other risk transfer systems that are dependent upon specific legal criteria and/or circumstances (e.g., a provable, mechanical or design product malfunction/defect).

CRITICAL INSURANCE-RELATED COMPONENTS OF AN AV REGULATORY SCHEME

Any comprehensive AV legal/regulatory structure must include insurance-specific policies.

The following are what Travelers recommends for how best to address some of the most pressing insurance-related issues associated with AVs.

Specifically address insurance liability standards as the primary risk transfer mechanism.

Today, there are several risk transfer and liability schemes governing and impacting the auto market. These include insurance, common law negligence, various no-fault and personal injury protections statutory systems, product liability, Federal Trade Commission representation and advertising regulations, state claims practice acts, fraud laws, and licensing requirements. While we anticipate that this will be the case in an AV world as well, we believe that auto insurance should play the same primary risk transfer role in that world as it does now for non-AVs.

Notably, legal systems are already evolving to address novel compensation issues surrounding AV collisions. For example, in its recent review of a fatal crash involving a Tesla, the National Transportation Safety Board determined that the Tesla autopilot feature should share some blame for the crash, along with the two drivers involved who both acted negligently.²³ The decision demonstrates how layered and varied risks, legal and factual analyses, and contributory fault can and will be addressed in the AV world by utilizing existing legal systems.

The insurance industry will adapt to this increased complexity, and Travelers is ready to lend its expertise to regulators and legislators who are working through these changes.

Thus, any policy proposals regarding governance of AV liability should specifically address compensation systems and insurance liability standards, including who is responsible for obtaining coverage. As with the current auto insurance system, AV owners should be responsible for obtaining and maintaining adequate insurance. This should apply whether the vehicle is a personal car, a ride-share vehicle or a company-owned vehicle.

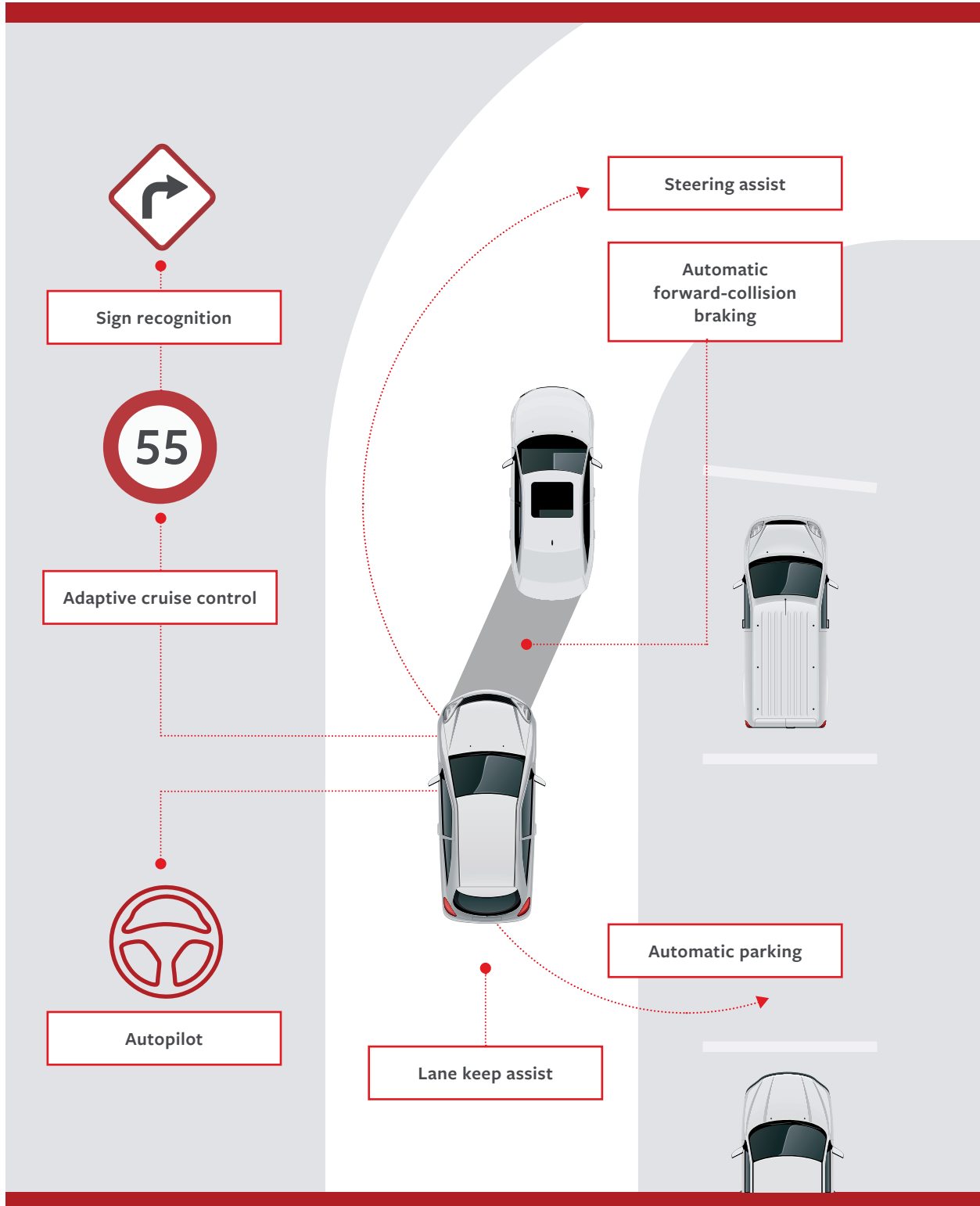
Because there may be many possible approaches to liability and compensation for AVs, including systems that may not exist today, a framework is needed to evaluate various options. An AV liability system should be evaluated on its ability to achieve the best balance of the following three objectives:

- **Provide full and timely compensation for victims** – Injured parties should be made whole without delay.
- **Efficient claim resolution** – Minimize expensive and protracted liability determinations for most accidents.
- **Encourage adoption of AVs and increased safety of AVs** – A liability system should, through its pricing of risk, encourage the AV industry to achieve safer outcomes as insurers have done for decades through the Insurance Institute for Highway Safety and other efforts.

■ Provide for sufficient coverage limits at the vehicle level.

Although Travelers anticipates that fewer accidents will occur with more (or all) AVs on the road, accidents that do occur could potentially be more costly, particularly with respect to vehicle damage. For example, take the comparative costs of similar front-end damage between the 2017 and 2018 models of a popular sedan. According to Travelers claim data, the cost associated with fixing the 2018 model can be as much as three times higher than the 2017 model, primarily due to the collision avoidance technology in the front grill and bumper of the 2018 model.

Self-driving features available in cars today



Thus, any insurance scheme must require sufficiently high coverage limits, including adequate limits for property damage to address more expensive technology in AVs. Higher minimum limits, especially for bodily injury, may also provide peace of mind and remove barriers to societal adoption of AVs.

■ Standardize data governance and cybersecurity requirements.

AVs present new questions and opportunities with respect to data collection and management, which has only been heightened by recent developments related to social media data and privacy. While Travelers is agnostic with respect to who develops and imposes data management requirements, Travelers supports standardization (via legislation or regulation, for instance) of data collection, sharing, storage and security requirements.

To facilitate an effective and efficient AV auto insurance system, the government should require timely data sharing (by auto manufacturers and others who obtain data on crashes and AV performance) with insurance providers (with, of course, adequate protections for consumer privacy). Sharing data with insurers would help facilitate proper insurance coverage in several ways, including:

- establishing liability/causation in the event of an accident (a function performed by the insurance carrier, not the customer).
- assisting with accurate underwriting and pricing of insurance policies.
- contributing to risk mitigation and control measures (e.g., via software updates).

Ultimately, standardization of data governance and assurance of data sharing with insurers benefit all parties involved, including vehicle owners, collision victims, manufacturers and insurance providers.



Similarly, Travelers supports developing strong cybersecurity requirements for AVs – an issue that is intertwined with the creation of data management standards. Cyber-related risks impact the safety of our communities in an AV world, and thus must be addressed. This also highlights the need for appropriate data sharing protocols. If a cyber incident occurred, it would be important to have the data explaining what happened, not only for insurance-related purposes, but also for future risk mitigation and preventive efforts.

Further, Travelers supports the creation of an expert advisory board or committee to address data and cybersecurity issues, including how these issues are related and how they can effectively be addressed together. Insurer representation on any such body would be essential.

■ Ensure representation of the insurance industry in policymaking and stakeholder forums.

Travelers supports using advisory boards and task forces comprised of private- and public-sector experts to help inform AV policymaking processes and content, and we encourage policies that will ensure that the insurance industry has a seat at the table. Many stakeholder groups beyond insurers will have an interest in the development and implementation of new AV policies, including consumer groups, trade groups, manufacturers, technology developers and suppliers, attorneys, regulators, legislators, public policy academics/researchers and countless others. However, insurers will have unique and valuable insights into several of the key issues that will likely arise from AV technology, such as risk assessment and mitigation, big data analysis, the functioning of comprehensive liability regimes and navigating state-federal coordination issues. As a longtime industry leader and innovator in both commercial and personal lines of insurance, Travelers is well positioned to contribute to these policymaking discussions. Travelers also supports – and would be willing to lead – the creation of a nongovernment stakeholder coalition to address and make recommendations with respect to insurance-related AV issues.

■ Promote communication and coordination between policymakers and other stakeholders.

Many lawmakers and regulators at the local, state and federal levels are grappling with the policy challenges and opportunities related to the AV world, as are private industry groups and individual companies. Coordination among these players is essential to a coherent and rational regulatory structure that will promote growth and adoption of AV technology, as well as public safety, during this transition phase of AVs and beyond.

One important step is public-private cooperation via standing advisory boards or similar structures. Such bodies generally promote consensus building and creation of best practices, while also recognizing the need for flexibility to promote consumer-driven private-market competition and innovation.

At the policymaker level, Travelers encourages local, state and federal officials to work together to the greatest extent possible. The current state-based regulatory and oversight structure for insurance is well established and provides certainty for businesses and consumers. To build upon this existing structure and promote uniformity between AV-related insurance approaches – both during the AV transition/testing phase and after fully autonomous vehicles are publicly available – Travelers would support development of a model state law, as well as collaboration between the U.S. Department of Transportation and state regulators (perhaps through the NAIC).

Finally, Travelers encourages all policymakers to communicate openly and regularly with the public as policy discussions are conducted and decisions are made. Transparency in the process will encourage public buy-in with respect to evolving AV technology and related safety measures.

Utilize existing insurer delivery systems to communicate with consumers.

AVs likely will require some human involvement for the foreseeable future. Accordingly, there may be opportunities to increase overall AV safety by educating drivers about the evolving technology and their roles and responsibilities with respect to driving functions. To the extent government officials develop consumer notification standards and requirements regarding AV technology, safety guidelines, distracted driving notifications and other important information, Travelers and other insurers can use their extensive delivery systems to facilitate communication of those standards to consumers.

CONCLUSION

In summary, Travelers believes that auto insurance can, and will, meet society's needs in an AV world by continuing to compensate affected consumers with speed, fairness and efficiency. Also, any comprehensive AV legal/regulatory structure must include insurance-specific components, including:

- addressing insurance liability standards as the primary risk transfer mechanism.
- providing for sufficient coverage limits at the vehicle level.
- standardizing data governance and cybersecurity requirements.
- ensuring representation of the insurance industry in policymaking and stakeholder forums and discussions.

Travelers looks forward to working with policymakers and other stakeholders to develop AV insurance policy and regulations that make sense for and benefit this growing industry and its consumers.



TRAVELERS INSTITUTE® | TRAVELERS

About the Travelers Institute

Travelers established the Travelers Institute as a means of participating in the public policy dialogue on matters of interest to the property casualty insurance sector, as well as the financial services industry. The Travelers Institute draws upon the industry expertise of Travelers senior management and the technical expertise of its risk professionals, and other experts, to provide information, analysis and recommendations to public policymakers and regulators.

SOURCES:

- ¹ SAE International, Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.
https://www.sae.org/standards/content/j3016_201806/
- ² Waymo, "Waymo's fully self-driving vehicles are here." Press release. 7 Nov. 2017.
<https://medium.com/waymo/with-waymo-in-the-drivers-seat-fully-self-driving-vehicles-can-transform-the-way-we-get-around-75e9622e829a>
Accessed 11 Apr. 2018.
- ³ Trov, "Trov and Waymo partner to launch insurance for ride-hailing." Press release. 19 Dec. 2017.
<https://www.prnewswire.com/news-releases/trov-and-waymo-partner-to-launch-insurance-for-ride-hailing-300573229.html>
Accessed 11 Apr. 2018.
- ⁴ Central Ohio Transit Authority (COTA), "COTA congratulates City of Columbus on winning Smart City Challenge." Press release. 24 June 2016.
<https://www.cota.com/wp-content/uploads/2017/06/COTA-Congratulates-Columbus-on-Winning-Smart-City-Challenge.pdf>
Accessed 11 Apr. 2018.
- ⁵ University of Michigan, Mcity Test Facility.
<https://mcity.umich.edu/our-work/mcity-test-facility/>
- ⁶ City of Los Angeles, "Mayor Garcetti announces new coalition for transportation technology." Press release. 17 Nov. 2015.
https://www.lamayor.org/mayor_garcetti_announces_new_coalition_on_transportation_technology
Accessed 11 Apr. 2018.
- ⁷ City of Austin, Smart Mobility Roadmap.
https://austintexas.gov/sites/default/files/files/Smart_Mobility_Roadmap_-_Final.pdf
- ⁸ City of San Francisco: Advanced Transportation and Congestion Management Technologies Development Initiative (ATCMTD).
<https://www.sfmta.com/sites/default/files/projects/2017/ATCMTD%20Grant%20Application.pdf>
- ⁹ Bloomberg Philanthropies, "Nashville, US is preparing."
<https://avscities.bloomberg.org/global-atlas/americas/us/nashville-us>
- ¹⁰ Washington, DC, "Mayor Bowser Establishes Autonomous Vehicle Working Group." Press release. 12 Feb. 2018.
<https://dc.gov/release/mayor-bowser-establishes-autonomous-vehicle-working-group>
- ¹¹ Business Insider, "These 20 companies are racing to build self-driving cars in the next 5 years." News article. 11 Dec. 2016.
<http://www.businessinsider.com/companies-making-driverless-cars-by-2020-2016-11#tesla-made-a-big-move-this-year-to-meet-its-goal-of-having-a-fully-self-driving-car>
Accessed 11 Apr. 2018.
- ¹² Automotive News, "Volkswagen readies its robo-fleets." News article. 17 Sept. 2017.
<http://www.autonews.com/article/20170917/MOBILITY/170919808/>
Accessed 11 Apr. 2018.
- ¹³ Morgan Stanley and Boston Consulting Group, Motor Insurance 2.0 Blue Paper, 29 Sept. 2016.
http://image-src.bcg.com/Images/Motor-Insurance-2.0-Oct-2016_tcm9-187099.pdf
- ¹⁴ Insurance Institute for Highway Safety, Robot cars won't retire crash-test dummies anytime soon, Status Report, Vol. 51, No. 8 Special Issue: Autonomous Vehicles. 10 Nov. 2016.
<http://www.iihs.org/iihs/news/desktopnews/driver-seat-robot-cars-wont-retire-crash-test-dummies-anytime-soon>
- ¹⁵ University of Michigan Transportation Research Institute, A Preliminary Analysis of Real-World Crashes Involving Self-Driving Vehicles. October 2015.
http://www.umich.edu/~umtrisiw/PDF/UMTRI-2015-34_Abtract_English.pdf
- ¹⁶ National Transportation Safety Board, Preliminary Report: Crash and Post-crash Fire of Electric-powered Passenger Vehicle. June 2018.
<https://www.ntsb.gov/investigations/AccidentReports/Pages/HWY18FH011-preliminary.aspx>
- ¹⁷ National Transportation Safety Board, Preliminary Report Released for Crash Involving Pedestrian, Uber Technologies, Inc., Test Vehicle. May 2018.
<https://www.ntsb.gov/news/press-releases/Pages/NR20180524.aspx>
- ¹⁸ U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Fatalities by Mode.
<https://www.bts.gov/content/transportation-fatalities-mode>
- ¹⁹ KPMG, The chaotic middle: The autonomous vehicle and disruption in automobile insurance, June 2017.
<https://home.kpmg.com/us/en/home/insights/2017/05/the-chaotic-middle-autonomous-vehicle-disruption-automobile-insurance.html>
- ²⁰ National Conference of State Legislatures, Autonomous Vehicles, Self-Driving Vehicles Enacted Legislation, 25 June 2018.
<http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>
- ²¹ National Association of Insurance Commissioners, Innovation and Technology Executive Committee Task Force, 2018 Charges.
http://naic.org/cmte_ex_itff.htm
- ²² Journal of Insurance Regulation, "Regulatory Issues Related to Autonomous Vehicles." Vol. 35, No. 7.
http://www.naic.org/prod_serv/JIR-ZA-35-07-EL.pdf
- ²³ National Transportation Safety Board, Collision between a Car Operating with Automated Vehicle Control Systems and a Tractor-Semitrailer Truck. 7 May 2016.
<https://www.ntsb.gov/news/events/Documents/2017-HWY16FH018-BMG-abstract.pdf>

[illegible]



TRAVELERS INSTITUTE® | TRAVELERS 

travelersinstitute.org

The Travelers Institute, 700 13th Street NW, Suite 1180, Washington, DC 20005

© 2018 The Travelers Indemnity Company. All rights reserved. Travelers and the Travelers Umbrella logo are registered trademarks of The Travelers Indemnity Company in the U.S. and other countries.
M-18303-1 New 7-18