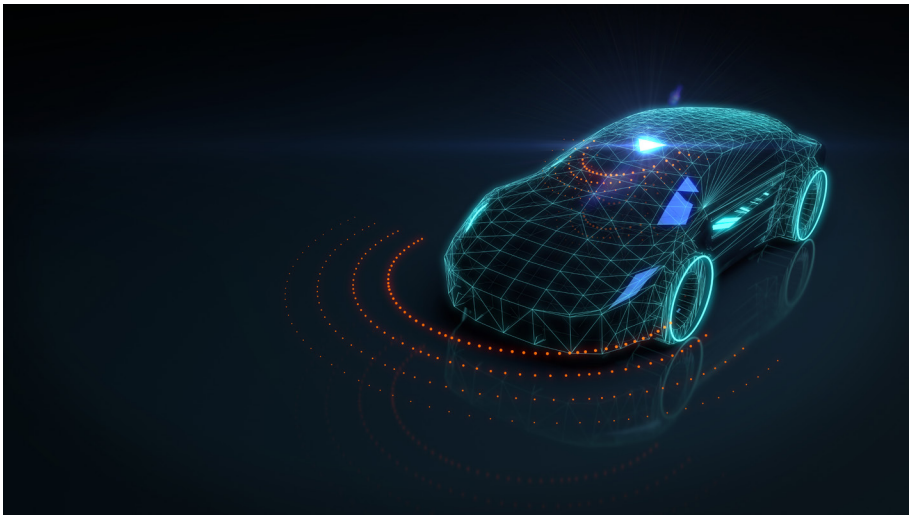
Personal Lines Emerging Risk: Autonomous Vehicles



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Developed: 05/27/23

CISR Other Personal Lines Solutions

THE NATIONAL ALLIANCE
for Insurance Education & Research

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THE NATIONAL ALLIANCE
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Introduction

Would you believe that Leonardo Di Vinci was actually thinking about autonomous vehicles in the 1500s? He created a cart that could move without being pushed or pulled using a system where springs under high tension provided power, and the steering was set in advance so the cart could move along a predetermined path.

Autonomous vehicles (AVs) are evolving rapidly. According to Renub Research, the United States market for autonomous vehicles will grow into a $325.9 billion industry by 2030. Compare this to a $4 billion industry in 2021 and a prediction of $37 billion by 2023.[1] In addition, the Insurance Institute for Highway Safety anticipates 3.5 million self-driving vehicles on U.S. roads by 2025 and 4.5 million by 2030, though these would be comprised of semi-, rather than fully-autonomous, vehicles.[2]

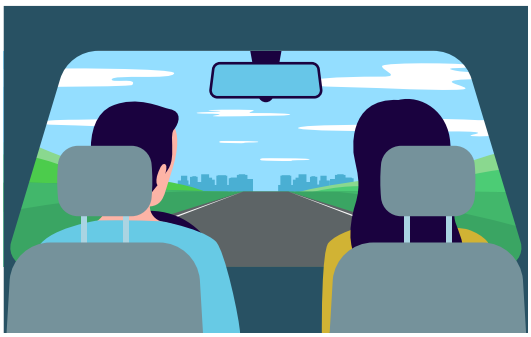
It is expected that AVs will enhance safety on the roads, reduce injuries to vehicle occupants, and perhaps even increase productivity. In 2022, The World Health Organization (WHO) reported that an estimated 1.3 million deaths and between 20–50 million injuries[3] could be attributed to automobile accidents. WHO goes on to say that one burgeoning consideration for mitigating risk is the use and improvement of vehicle safety features. The rapid advancement and reliance on technology in semi-autonomous and autonomous vehicles is one such safety feature that shows great promise for keeping roadways safer. For example, crash avoidance technology is one feature of both semi- and fully-autonomous vehicles. As the roads become more saturated with these vehicles, insurers and other agencies will be able to collect sufficient and necessary data to determine the actual improvements in safety and conditions.

1 *"United States Autonomous Vehicles Market, Size, Forecast 2021-2030, Industry Trends, Growth, Impact of Covid-19, Opportunity Company Analysis." Renub, April 2022, https://www.renub.com/united-states-autonomous-vehicles-market-p.php*

2 *"Background on: Self-Driving Cars and Insurance," Insurance Information Institute, August 17, 2022, https://www.iii.org/article/background-on-self-driving-cars-and-insurance*

3 *Road traffic injuries," World Health Organization, June 20, 2022, https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries*

Consider the Risk(s)



First, it is important to understand the five levels of vehicle autonomy. The framework for categorizing autonomous vehicles developed by the Society of Automotive Engineers (SAE) is one of the most recognized. SAE defines six levels of automation[4]:

SAE Level 0™ – The human at the wheel steers, brakes, accelerates, and negotiates traffic.

SAE Level 1™ (Driver Assistance) – Under certain circumstances, the car controls either the steering or the vehicle speed. However, if the system fails, the driver intervenes (i.e., cruise control).

SAE Level 2™ (Partial Driving Automation) – The vehicle can steer, accelerate, and brake in certain circumstances. The driver must still perform tactical movements like changing lanes or looking for hazards (i.e., lane assistance or adaptive cruise control).

SAE Level 3™ (Conditional Driving Automation) – The vehicle can manage most of the driving, including monitoring the environment. The system will request a driver to intervene when it encounters something it cannot determine or navigate. The driver must still pay attention at all times and be ready to take control (i.e., Audi's A1 Traffic Jam Pilot).

SAE Level 4™ (High Driving Automation) – Steering and pedals may remain installed, but no human input or insights are required except under some conditions (poor weather). The driver could manage driving on surface streets and then become a passenger on the highway.

SAE Level 5™ (Full Automation) – Enjoy the ride! The car will fully operate itself on any road and under any circumstances. As a passenger, you enter the destination into the navigation system, and the car takes over from there.

4 *"SAE Levels of Driving Automation™ Refined for Clarity and International Audience", SAE International, May 3, 2021, https://www.sae.org/blog/sae-j3016-update*

SAE J3016™ LEVELS OF DRIVING AUTOMATION™

Learn more here: sae.org/standards/content/j3016_202104

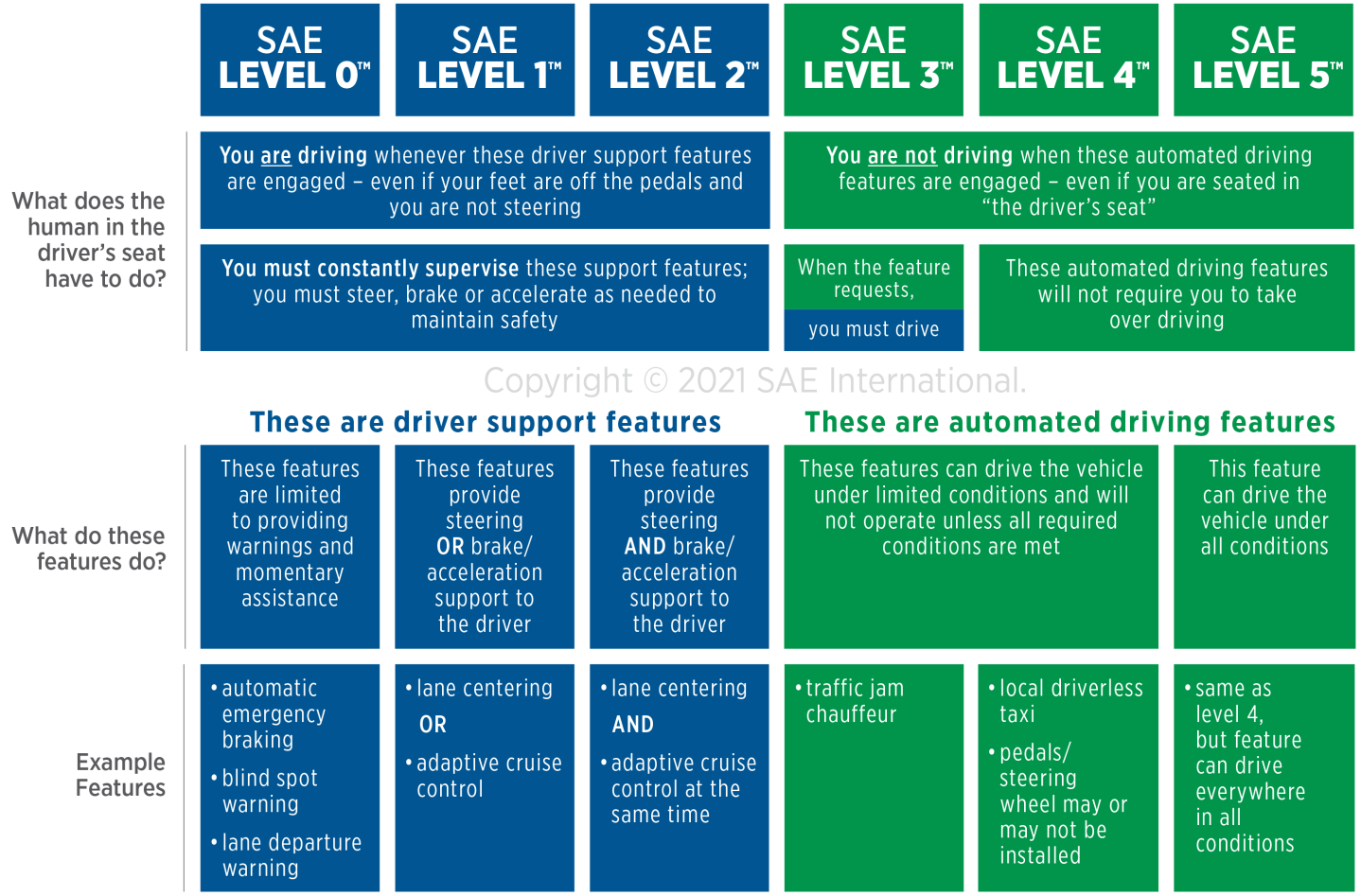


Figure 1: Image Credit, SAE International

Human Risk Factors

How much do you trust a self-driving vehicle? In 2023, the American Automobile Association (AAA) reported that 68% of American drivers are skeptical of self-driving vehicles, up from 55% the year before. The fact is, though, we are already operating vehicles that are semi-autonomous, which is paving the way for fully-autonomous vehicles. This same AAA report also identified that consumers are more interested in improved safety features over self-driving vehicles. AAA's Director of Automotive Engineering states, "You can't sell consumers on the future if they don't trust the present."

Let's look at some preliminary statistics. The Insurance Institute for Highway Safety (IIHS) and the Highway Loss Data Institute (HLDI) have produced numerous reports detailing loss and severity reduction in vehicles with semi-autonomous features such as lane assist, lane centering, forward collision avoidance/prevention, automatic emergency braking (AEB), and the like. For example, claims data from the 2017–18 Nissan Rogue showed that Nissan's assistive technology had an associated "one percent reduction in collision claim frequency and a **12 percent** reduction in property damage liability claim frequency."[5] In research cited by IIHS and HLDI in a February 2017 article, it was found that forward collision warning (FCW) systems reduced rear-end collisions by as much as **27 percent,** while FCW with AEB systems reduced rear-end collisions by 50 percent.[6]

It's clear that in the face of reliable technology, collision frequency is reduced, which could reasonably relate to a reduction in bodily injury as well. But there is a negative side to driver-assistive technology. Many sources suggest that the assistive technology names that automobile manufacturers use, like Autopilot, lead drivers into a false sense of security. **Drivers may be overestimating safety features and yielding more control to the vehicle than it is capable of handling.**

In 2021, the National Highway Traffic Safety Administration (NHTSA) issued a Standing General Order requiring manufacturers and operators to report certain crashes involving vehicles that use SAE Level 2™ (Partial Driving Automation) Advanced Driver Assistance Systems (ADAS). In a 2022 report that captured data between July 2021 and May 2022, twelve entities had reported 392 Level 2 crashes, with the bulk of those reported (258) being recorded/reported by telematics, and 273 of those crashes were reported by Tesla, Inc.[7] [This data is not to be used comparatively, as the data is still underreported and still being understood.]

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5 *Benefits from advanced driver assistance systems are growing, new HLDI study finds," Insurance Institute for Highway Safety, April 16, 2020, https://www.iihs.org/news/detail/benefits-from-advanced-driver-assistance-systems-are-growing-new-hldi-study-finds*

6 *Jessica B. Cicchio, "Effectiveness of forward collision warning and autonomous emergency braking systems in reducing front-to-rear crash rates," Accident Analysis and Prevention, no. 99 (2017): 142-152, Accessed May 3, 2023, https://doi.org/10.1016/j.aap.2016.11.009*

7 *Summary Report: Standing General Order on Crash Reporting for Level 2 Advanced Driver Assistance Systems, National Highway Traffic Safety Administration, US Department of Transportation, June 2022, https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-06/ADAS-L2-SGO-Report-June-2022.pdf*

Repairs

While collision frequency and severity have proven to be reduced with the addition of crash avoidance features, the costs of repairing vehicles with such advanced features are rising. The Insurance Institute of Highway Safety (IIHS) identified that a simple windshield repair typically costs an estimated $250, but for vehicles equipped with forward collision avoidance, the same glass replacement may cost more than $1,000.[8] In addition, post-repair technology problems are common following collision damage.

In a web article posted on *TheAutopian.com*, one particularly interesting claim in Ohio detailed the profound costs of what appeared to be a "minor looking fender-bender" between a Lexus RX330 and a Rivian R1T (fully electric SAE Level 2™ vehicle).[9] Let's look at the high points of the claim:

- The Lexus rear-ended the Rivian.
- The adjuster of the Lexus initially valued the damage to the Rivian at $1,600.
- Ohio only has three certified repair shops for Rivian; one of these shops was chosen and video-documented the damage assessment process for the claim.
- The final repair cost was $42,000!!!

Can you imagine if the at-fault driver carried Ohio state minimum limits (25/50/25)? In chat forums, it's reported that the Lexus driver had a property damage liability limit of just $50,000. Yikes!

Figure 2: Damage to Rivian resulting in $42,000 repair bill. Image originally posted by eHauler on Rivian Owners Forum, May 1, 2023.

8 *Crash avoidance features improve safety, but complicate repairs," Insurance Institute of Highway Safety, February 15, 2023, https://www.iihs.org/news/detail/crash-avoidance-features-improve-safety-but-complicate-repairs*

9 *Jason Torchinsky, "Here's Why That Rivian RIT Repair Cost $42,000 After Just a Minor Fender-Bender," The Autopian, May 16, 2023, https://www.theautopian.com/heres-why-that-rivian-r1t-repair-cost-42000-after-just-a-minor-fender-bender/*

Cyber Security Risk Factors

Concerns about cyber security first appeared in the 80s and 90s with the introduction of the world wide web. Nearly 30+ years later, we are no longer just worried about computer crashes and bugs. Now, we are also concerned with the cyber security of technology integrated into vehicles, which creates much concern about vehicle safety. To be fully autonomous, vehicles will need to access information about their surroundings using radar, sensors, software, onboard cameras, and LiDAR (light detection and ranging). It would not be surprising if the evolution of technology also began to use information from the internet as well as live data collected from sources around them, such as other vehicles, traffic cameras, and possibly cellular data collected from other drivers and pedestrians. All such data collections may serve as access points into vehicles' information systems, creating potential vulnerabilities.

In a blog by the University of North Dakota,[10] several high-level points are made that we should consider.

- Regulation and governance of autonomous machines (including vehicles) is very limited. Greater regulation could stagnate progress to what many see as a cornerstone of economic growth.
- Self-driving cars could be hacked with ransomware, with demands for ransom.
- Terrorists could disable networks, resulting in collisions.
- Hacked autonomous vehicles could expose sensitive personal data maintained on the vehicle, as well as other personal devices connected to the vehicle.
- Could connected vehicles disable or control home devices and expose home networks to hackers?

10 *"Cyber Security of Autonomous Machines and Systems," University of North Dakota, Accessed May 27, 2023, https://onlinedegrees.und.edu/blog/cyber-security-of-autonomous-machines-and-systems/*

Product Liability Intersection

When more control is given to vehicle systems, will more liability then be assumed by the manufacturer, software developer, or hardware supplier of the vehicle? As with any technology, there will be concerns about design flaws, software glitches, hardware failures, and simple wear and tear that could increase the chance of unexpected malfunction occurrences, which may ultimately lead to accidents or injuries. Though such risks are generally addressed through manufacturers' product liability insurance, the more technology added to a vehicle, the more likely both the driver and the auto manufacturer may share in the liability of an accident, which could complicate claims.

In a report addressing reliability safety data and the liability of autonomous vehicles, RAND corporation had this to say: "In the context of autonomous vehicles, a false positive would occur if data suggest that autonomous vehicles perform better than human drivers, when in fact they do not—a dangerous proposition for policymakers, technology developers, the insurance industry, and, of course, consumers."[11] This statement essentially points to the fact that the study of such data is still primarily a science and not always a *FACT.* If data is misinterpreted and subsequently misapplied, the implications could be particularly dangerous for insurance companies and the risks they assume.

Will autonomous vehicles affect personal auto policies as we know them?

Underwriting/Eligibility/Rating

Underwriters and actuaries use historical data to determine risk and set premiums for policy coverage. Unfortunately, there just is not enough reliable data for semi- and fully-autonomous vehicles to accurately assess the risks associated with insuring these vehicles and their drivers. The future of underwriting may need to shift more heavily toward underwriting the owner and driver, taking into consideration:

- Owner financial stability to pay for timely maintenance costs and technology
- Owner/driver education used to evaluate abilities to adapt to, understand, and utilize technology
- Driver training on vehicle systems and capability to perform manual system overrides or manually operate the vehicle in emergencies

11 *Nidhi Kalra & Susan M. Paddock, "Driving to Safety: How many miles of driving would it take to demonstrate autonomous vehicle reliability?" RAND Corporation, 2016, https://www.rand.org/pubs/research_reports/RR1478.html*

Policy Language

Think about the definition of "insured" under the Liability Coverage section of the Personal Auto Policy.

> "Insured" as used in this Part means:
>
> 1. You or any "family member" for the ownership, maintenance or use of any auto or "trailer".
> 2. Any person using "your covered auto".
> 3. For "your covered auto", any person or organization but only with respect to legal responsibility for acts or omissions of a person for whom coverage is afforded under this Part.
> 4. For any auto or "trailer", other than "your covered auto", any other person or organization but only with respect to legal responsibility for acts or omissions of you or any "family member" for whom coverage is afforded under this Part. This provision (B.4.) applies only if the person or organization does not own or hire the auto or "trailer".

Consider the possibility that an entity involved in the development, manufacturing, or maintenance of the vehicle could fault the owner/driver for untimely or lack of proper maintenance (upkeep or technology subscriptions/security, etc.) or possibly operating the vehicle outside of the capabilities of the vehicle's design. Take a look at item #3 of the policy language again. If, down the line, a person (as the owner of a semi- or fully-autonomous vehicle) is determined to carry legal liability for the operation of their owned vehicle, could a manufacturer then gain "insured" status under the Personal Auto Policy?

Will the definition of "insured" in Part A – Liability Coverage need to change to either explicitly include or exclude manufacturers or suppliers for vicarious liability? Consider what the implications could be one way or the other.

Resources

First Autonomous Vehicle Fatality

Cadie Thompson, "The first self-driving car death may have just happened," Business Insider, June 30, 2016, https://www.businessinsider.com/tesla-model-s-autopilot-fatal-crash-2016-6

The National Highway Traffic Safety Administration said the 2015 Tesla Model S was in Autopilot mode when the accident occurred. The evaluation aims to "determine whether Autopilot worked according to expectations," according to Tesla. The Model S was driving down a divided highway when a tractor-trailer cut across the highway perpendicular to the vehicle.

"Neither Autopilot nor the driver noticed the white side of the tractor trailer against a brightly lit sky, so the brake was not applied. The high ride height of the trailer combined with its positioning across the road and the extremely rare circumstances of the impact caused the Model S to pass under the trailer, with the bottom of the trailer impacting the windshield of the Model S," Tesla said in its blog post.

The agency concluded that the crash did not result from a flaw in the system but that the system lacked safeguards to prevent its misuse.

Hertzberg v Uber

Richard Gonzales, "Feds Say Self-Driving Uber SUV Did Not Recognize Jaywalking Pedestrian in Fatal Crash," NPR, November 7, 2019,
https://www.npr.org/2019/11/07/777438412/feds-say-self-driving-uber-suv-did-not-recognize-jaywalking-pedestrian-in-fatal-

Mark Harris, "NTSB Investigation Into Deadly Uber Self-Driving Car Crash Reveals Lax Attitude Toward Safety," IEEE Spectrum, November 7, 2019,
https://spectrum.ieee.org/ntsb-investigation-into-deadly-uber-selfdriving-car-crash-reveals-lax-attitude-toward-safety

- Hertzberg v Uber (2018) – Elaine Hertzberg was killed in 2018 by a manned self-driving Uber vehicle (a pilot program) while crossing a four-lane road with her bike outside the boundaries of a crosswalk.
- Hertzberg was detected by the vehicle six seconds before the crash. Three sensor systems (radar, LiDAR, and a camera) could not analyze Hertzberg or predict her path until 1.2 seconds before the crash.
- The operator manning the vehicle was watching a video on their phone at the time of the incident. When the vehicle recognized that a crash could not be avoided, it inhibited automatic braking for a full second while altering and giving back control to the operator. This "action suppression" was designed by the manufacturer.
- A crash scene reenactment determined that a human driver would have detected Hertzberg at least 638 feet away.

- Hertzberg's family reached a settlement with Uber, the terms of which were not disclosed.
- The Uber driver was charged with negligent homicide.[12] (As of May 27, 2023, there have been no recent public updates on the status of this case.)

Complaints About Autopilot

"Apple engineer killed in 2018 Tesla crash had complained about Autopilot," Associated Press, CNBC, February 11, 2020,
https://www.cnbc.com/2020/02/11/man-killed-in-2018-tesla-crash-had-complained-about-autopilot.html

- In 2017, the owner/driver of an autonomous vehicle submitted complaints to the manufacturer about malfunctions in his Tesla's Autopilot before the fatal single-vehicle crash. The crash involved the vehicle veering toward and hitting a road barrier. The complaints reported were:
  - The Autopilot previously had misdirected the vehicle in the same location as the fatal crash.
  - The malfunction began occurring after a software patch.
  - A manufacturer service center could not duplicate the reported problem, which resulted in no repairs.
  - Eleven days before the fatal crash, the road barrier had been damaged by another vehicle. The Department of Transportation had not yet made any repairs to the road barrier.
- In 2019, in a separate incident (in a different state), the driver of a vehicle activated their Tesla's Autopilot, and ten seconds later, the vehicle drove underneath a tractor-trailer that pulled out from a driveway and horizontally crossed lanes in front of the vehicle. The top of the vehicle was sheared off while passing under the trailer, and it then continued another quarter of a mile before coming to a stop. First responders were unaware of how to disable the vehicle.

Additional Resources/References:

https://www.nhtsa.gov/equipment/driver-assistance-technologies

https://www.nhtsa.gov/technology-innovation/vehicle-cybersecurity

https://arizonalawreview.org/pdf/61-4/61arizlrev983.pdf

12 *Matt McFarland, "Uber self-driving car operator charged in pedestrian death," CNN Business, September 18, 2020, https://www.cnn.com/2020/09/18/cars/uber-vasquez-charged/index.html*

Resource Quiz

1. **Risk Identification**

   What questions could you ask clients to help determine whether they have an exposure to this risk?

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   _____

   _____

   _____

2. **Risk Analysis**

   What are some potential property and/or liability exposures that may occur with this risk? What questions could you ask to determine risk level or severity?

   _____

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3. **Risk Control**

   How might a client avoid, prevent, or reduce the property and/or liability exposures outlined above?

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4. Risk Finance

What risk financing solutions might you recommend to clients, including policies or policy endorsements?

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5. Risk Administration

Once you and your client have implemented a coverage plan, what steps might you take to monitor the risk?

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Resource Remediation

1. **Risk Identification**

   What questions could you ask clients to help determine whether they have an exposure to this risk?

   Do you own or plan to own a vehicle equipped with autonomous driving features?

   Are you employed by a company that uses autonomous vehicles for work-related purposes?

   Do you frequently drive in areas where autonomous vehicles are being tested or deployed?

   Do you currently own or plan to purchase an electric vehicle? (Owners of electric vehicles are more open to technology and are more likely to adopt driverless features when they become available.)

2. **Risk Analysis**

   What are some potential property and/or liability exposures that may occur with this risk? What questions could you ask to determine risk level or severity?

   Have you ever been involved in an accident where you were the operator of a vehicle with automated or driverless features?

   What is your experience or familiarity with your vehicle's automated or driverless features?

   If your vehicle has automated driving features, how often do you enable or disable those features? (Many drivers disable features out of frustration, which could elevate their risk due to an inability/resistance to adapt to the features.)

   Did you allow the manufacturer/dealership to train you and practice your vehicle's automated or driverless features?

   Do you believe there are changes in your driving behavior when operating vehicles with semi-autonomous or fully-autonomous features?

3. **Risk Control**

How might a client avoid, prevent, or reduce the property and/or liability exposures outlined above?

Encourage clients to be vigilant about any changes in their driving behavior or habits due to the presence of or while operating autonomous vehicles.

Urge clients to follow recommended safety protocols while using autonomous or driver-assistive features.

Insurance professionals may consider providing risk mitigation guidance to insureds. These may include recommendations on best practices, safety, and technological developments that can help minimize exposures and enhance safety.

Regular servicing and inspections of the vehicle with autonomous or driver-assistive features can help identify and address potential issues before they become major concerns, reducing the risk of accidents or malfunctions.

Encourage clients to take the time to understand the vehicle's technology and practice using the technology in a safe or low-risk area (such as an open parking lot).

Alternatively, Departments of Transportation and state/federal government must improve infrastructure to support the accuracy of vehicle technology and work to repair roads and barriers quickly.

4. **Risk Finance**

What risk financing solutions might you recommend to clients, including policies or policy endorsements?

Clients may not drive autonomous vehicles but may have a higher exposure to being injured or damaged by one; consider adequate coverage: Med Pay, PIP, and/or UM/UIM Coverages.

Maintaining higher limits of liability coverage (up to and including a Personal Umbrella) will prove to be ideal not only in paying claims but also for the essential defense coverage provided by personal auto policies.

Understand warranties or any other contractual benefits/language that may now or soon be offered when purchasing vehicles with driver assist features or which may be fully autonomous.

Personal Cyber Insurance may be another layer of coverage that will become necessary for owners/operators of connected/autonomous vehicles.

Self-funding or savings is a consideration. In the face of uncertain coverage, clients may need to ensure they have access to other financial resources in the face of a liability claim.

While Legal Expense Insurance will not pay monetary judgments or settlements, such coverage could be useful for ongoing litigation that may be outside the scope of the defense coverage provided in personal insurance policies.

5. Risk Administration

Once you and your client have implemented a coverage plan, what steps might you take to monitor the risk?

Regularly review personal auto policy language or speak to auto insurance company representatives to discover any coverage/policy language changes involving autonomous vehicles.

Regularly review current laws, pending litigation, and regulations related to autonomous vehicles in jurisdictions where the insurance professional conducts business.

Continue to monitor client adoption of technology to stay ahead of purchasing trends that may increase exposure.

Insurance professionals should continue providing insureds with current risk mitigation guidance.

Ultimately, insurance professionals should regularly interact with clients about their experiences, challenges, and feedback related to driver-assistive or autonomous vehicle features. This feedback can help identify emerging risks to discuss with insurance carriers and/or regulators in an effort to develop new risk management strategies.