# PREDICTING THE INEVITABLE: DESIGN DEFECTS OF AUTOMATED VEHICLES


## ABSTRACT

*To keep up with technology in this advanced and efficient society, you purchase a vehicle marketed as a "self-driving car." You are behind the wheel; the car has made a right turn and begins accelerating toward the on-ramp of the busy interstate. As you approach the flow of traffic and your lane narrows, the vehicle suddenly stops accelerating and steering.*[1] *The steering wheel of the vehicle is flashing red, but you are unsure what the signal means. The vehicle dramatically slows and starts to drift. You soon realize the self-driving technology has halted or disengaged, and you must take over operation of the vehicle immediately. You take control of the pedal and wheel just in time to merge into traffic and avoid an interstate collision.*

*The new, efficient, and exciting technology quickly became confusing and scary. If it can stop functioning that quickly, what else can it do? What would have happened if you were distracted? If something unexpected happens and leads to injury or damage, what would be your remedy? Whose responsibility is it to avoid accidents—you or the vehicle manufacturer?*


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1. *See, e.g.*, CBS Mornings, *The State of Self-Driving Cars*, YOUTUBE (Feb. 19, 2022), https://www.youtube.com/watch?v=W3n6bhl2FJI, at 3:20. A researcher test drove a Cadillac SUV in "super cruise" mode. While on the highway, it suddenly disengaged and rapidly slowed to approximately 30 miles per hour. The system disengaged because the vehicle reached a part of the roadway not on the software's recognized map.

## I. INTRODUCTION

Automated vehicles,[2] also known as "self-driving cars," were once a far-off dream, but have recently become reality.[3] They have been increasingly popular in recent decades.[4] A new market has emerged for the advanced technology and the ultimate product sold to consumers.[5] Many believe they will increase safety and save lives, given that motor vehicle accidents are a leading cause of death in the U.S. and an overwhelming majority of accidents are caused by human errors and deficiencies.[6] A positive economic impact is also anticipated.[7] Even with years of research and testing, automated vehicles are proving to be ill-equipped for road conditions.[8]

Like any product, there are foreseeable risks of harm associated, and the likelihood that design flaws will be revealed over time.[9] Legally speaking, one of the largest issues with automated vehicles are their complex designs.[10] They operate by way of interconnected technologies, including a myriad of sensors, cameras, maps, algorithms, and software.[11] Ultimately, the goal is to have all autonomous vehicles on the road that communicate with each other. These intricate systems arguably make malfunctions and design flaws more likely.

2. Automated vehicles are also commonly known as self-driving cars, driverless cars, robotic cars, or autonomous vehicles. This Article will use the term "automated vehicle" to refer generally to vehicles with some form of independent functioning or automation. *See Automated*, CAMBRIDGE DICTIONARY (4th ed. 2013) ("carried out by machines or computers without needing human control.").

3. *See infra* Part II.

4. *See infra* Part II.

5. *See infra* Part II.

6. Bryant Walker Smith, *Human Error as a Cause of Vehicle Crashes*, STAN. L. SCH.: THE CTR. FOR INTERNET & SOC'Y (Dec. 18, 2013, 3:15 PM), https://cyberlaw.stanford.edu/blog/2013/12/human-error-cause-vehicle-crashes [https://perma.cc/QA3A-22XA].

7. *Cost Data and Prevention Policies*, CTR. FOR DISEASE CONTROL & PREVENTION, https://www.cdc.gov/transportationsafety/costs/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fmotorvehiclesafety%2Fcosts%2Findex.html (Nov. 2, 2020) [https://perma.cc/5K25-78Q3].

8. *See infra* Part III.

9. *See infra* Part III.

10. *See, e.g.*, MICHAEL BARR, BOOKOUT V. TOYOTA: 2005 CAMRY L4 SOFTWARE ANALYSIS REPORT (Barr Grp.), https://homepage.cs.uiowa.edu/~tinelli/classes/181/Fall14/Papers/Barr13.pdf [https://perma.cc/WJ2D-F88V].

11. *See id.*; *infra* Part V.A.

This Article will address automated vehicles in the context of products liability—specifically design defect.[12] First, it will provide historical context and background information on the product itself, including common defects in products of this kind.[13] Next, it will outline trends in design defects, product liability law in general, and product liability law for human-operated vehicles.[14] Lastly, this Author will analyze automated vehicles under existing product liability law and predict outcomes in inevitable design defect suits.[15]

## II. UNDERSTANDING THE PRODUCT: WHAT IS AN AUTOMATED VEHICLE?

"Automated vehicles are those in which at least some aspect of a safety-critical control function (e.g., steering, throttle, or braking) occurs without direct driver input."[16] Essentially, the vehicle can do some functions on its own that a human driver traditionally would control.[17] Research for this visionary technology began in the mid-1980s and was accelerated by the work of the U.S. Defense Advanced Research Projects Agency.[18] Commercial development did not begin until the twenty-first century.[19] Today, automated vehicle functions range from minor corrective assistance to full steering, accelerating, and braking.[20]

The National Highway Traffic Safety Administration (NHTSA), an agency under the United States Department of Transportation, introduced a widely-used

12. This Article will not discuss the warning aspect of product defects. In addition to design defect products liability, automated vehicles present numerous other concerns that are not a focus of this Article. For example, states are enacting legislation to govern these types of vehicles, there are privacy implications with the products, and even ethical dilemmas. *See generally Autonomous Vehicles | Self-Driving Vehicles Enacted Legislation*, NAT'L CONF. OF STATE LEGISLATURES, https://www.ncsl.org/transportation/autonomous-vehicles (Feb. 18, 2020) [https://perma.cc/A3L2-9DFG]; Jack Boeglin, *The Costs of Self-Driving Cars: Reconciling Freedom and Privacy with Tort Liability in Autonomous Vehicle Regulation*, 17 YALE J.L. & TECH. 171 (2015); Noah Goodall, *Ethical Decision Making During Automated Vehicle Crashes*, 2424 J. TRANSP. RSCH. BD., Jan. 2014, at 58.

13. *See infra* Part II, III.

14. *See infra* Part IV.

15. *See infra* Part V.

16. *Automated Vehicle Research*, U.S. DEP'T TRANSP., http://www.its.dot.gov/automated_vehicle/index.htm [https://perma.cc/C9CM-Q33P].

17. *See id.*

18. JAMES M. ANDERSON ET AL., AUTONOMOUS VEHICLE TECHNOLOGY: A GUIDE FOR POLICYMAKERS 55–57 (RAND Corp. 2016).

19. *Id.*

20. *Id.* at 58–65.

classification system of automated vehicles based on technology levels and capabilities:[21]

Level 0: Momentary Driver Assistance. The system may provide momentary assistance such as lane departure alerts or emergency braking.[22] However, the driver must steer, brake, and accelerate.[23]

Level 1: Driver Assistance. The system continuously provides assistance with either acceleration and braking *or* with steering.[24] For example, these may include lane keeping assistance. Drivers are still to remain engaged and attentive.[25]

Level 2: Additional Assistance. The system continuously provides assistance with either acceleration and braking *and* with steering.[26] This would be akin to autopilot of aircrafts.

Level 3: Conditional Automation. The vehicle system actively performs all driving functions, but the driver must be available to take over when prompted.[27]

Level 4: High Automation. The "[s]ystem is fully responsible for driving" while the occupants are merely passengers.[28] However, these are only available and function in limited service areas.[29]

Level 5: Full Automation. The system is fully responsible for driving while the occupants are merely passengers.[30] It can be used universally—under all conditions and on any roadway.[31]

The levels, in order, have been explained most simply as: no automation, hands on, hands off, eyes off, mind off, and steering wheel optional.[32] Levels zero, one, and two require the driver to remain fully attentive and engaged.[33] Levels four

21. *Automated Vehicles for Safety*, NHTSA, https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety [https://perma.cc/NC32-D68D].

22. *Id.*

23. *Id.*

24. *Id.*

25. *Id.*

26. *Id.*

27. *Id.*

28. *Id.*

29. *Id.*

30. *Id.*

31. *Id.*

32. Scott M. Wadding & Delaney Schwarte, *Legislating Civil Liability of Automated Vehicles*, IOWA LAW., Mar. 2021, at 15.

33. *Automated Vehicles for Safety*, *supra* note 21.

and five do not require a human driver to operate.[34] These advanced levels are not currently available for consumer purchase, but they do function in other capacities.[35] Levels four and five are considered autonomous vehicles with complex HD maps created through a process of test vehicles repeatedly driving around and collecting data.[36]

Today, nearly all major vehicle manufacturers offer some level of automation in their newer models.[37] The market for and availability of these products is predicted to surge with time.[38] Some experts predict that with time they will have projections across the windshield, become office and entertainment spaces, or even have flight capabilities.[39]

## III. COMMON DEFECTS IN AUTOMATED VEHICLES

Given the novelty of the product and its complex design, automated vehicles are likely to contain defects. [40] For example, affected consumers may argue that the software was defective, or that the placement of sensors was defective. These imperfections could result in blind spots, delayed response, or improper functioning. Even considering the limited amount of time and areas these vehicles have been on the roads, problems have surfaced.[41]

A common issue with the sensor technology is that it has certain triggers, such as crosswalks and the lines on a roadway.[42] However, pedestrians often walk

34. *Id.*

35. *See, e.g.*, *Waymo One: The Future of Transportation is Here*, WAYMO, https://waymo.com/waymo-one/ [https://perma.cc/F8JB-REL6] (offering various autonomous vehicles, including ride-hauling services and even driverless trucking); Irving Firemen's Relief & Ret. Fund v. Uber Techs., No. 17-cv-05558-HSG, 2018 WL 4181954, at *7 (N.D. Cal. Aug. 31, 2018) (working on a similar offering for years).

36. WeRide Corp. v. Huang, 379 F. Supp. 3d 834, 842 (N.D. Cal. 2019).

37. Clifford Law, *The Dangers of Driverless Cars*, NAT'L L. REV., May 2021.

38. *Id.*

39. Forbes Technology Council, *14 Tech Experts Predict Exciting Future Features of Driverless Cars*, FORBES (Aug. 31, 2021, 1:15 PM), https://www.forbes.com/sites/forbestechcouncil/2021/08/31/14-tech-experts-predict-exciting-future-features-of-driverless-cars/?sh=2414b080719e [https://perma.cc/2927-BLNZ].

40. *See* BARR, *supra* note 10 (explaining vehicle software defects; a commonly known vehicle software defect causing injury is the Toyota electronic throttle code, which resulted in unintended acceleration).

41. *Id*.

42. *See Collision Between Vehicle Controlled by Developmental Automated Driving System and Pedestrian*, NAT'L TRANSP. SAFETY BD.,

outside of a crosswalk, and painted lines could be missing.[43] In the spring of 2018, a Volvo SUV owned by Uber Technologies was on a test drive in autonomous mode when it fatally struck a pedestrian.[44] The pedestrian was crossing in the middle of the roadway, pulling a bicycle in tow.[45]

According to the National Transportation Safety Board Report, the automated driving system "detected the pedestrian 5.6 seconds before impact[, but] . . . never accurately classified her as a pedestrian or predicted her path."[46] Further, the "system design precluded activation of emergency braking for collision mitigation, relying instead on the [standby] operator's [(driver's)] intervention."[47] A similar—thankfully—near-miss incident occurred during the taping of a national television news segment on automated vehicles when a Tesla's sensors did not detect a college student "jay-walking."[48]

Sensors often fail in other respects. In the same television segment, the Tesla vehicle approached a damaged guardrail and nearly sideswiped it.[49] Additionally, a Honda equipped with self-driving functions drove straight off the roadway into the grass at full speed.[50] Honda responded that the system is not intended or capable of detecting the end of a roadway, and it is the driver's responsibility to maintain control.[51]

Another danger common to automated vehicles is fire.[52] Some are created with lithium-ion batteries, which are highly combustible.[53] Accordingly, automated vehicles with these batteries have been known to start metal fires on the roadways, even spontaneously, without a collision contributing.[54]

https://www.ntsb.gov/investigations/Pages/HWY18MH010.aspx [https://perma.cc/E2N7-58NM].

43. *See id.*
44. *Id.*
45. *Id.*
46. *Id.*
47. *Id.*
48. *See* CBS Mornings, *supra* note 1.
49. *Id.*
50. *Id.*
51. *Id.*
52. Clifford Law, *supra* note 37.
53. *Id.*
54. *See id.*

A study was conducted by AAA using level two automated vehicles.[55] Thousands of miles traveling real-world roads revealed consistent issues.[56] Systems failed to keep vehicles in their lanes, and came too close to other vehicles and guardrails, or had "erratic lane position."[57] Vehicles would disengage with little notice, requiring immediate driver attention and control.[58]

These incidents could certainly give rise to serious injury and subsequent design defect product liability suits. As claims arise, courts will have to determine whether the unique product requires a unique analysis, or whether existing product liability frameworks will be sufficient.

## IV. General Design Defect Law

A design defect is commonly known to exist where a product is unreasonably unsafe because it contains an imperfection "the seller or distributor could have reduced or avoided" if it had adopted a reasonable alternative design rather than the one at issue.[59] However, "[e]ach state articulates the definition of a design defect in its own way."[60] Design is one of three types of actionable defects in addition to manufacturing and warning defects.[61] In most major products liability cases, design defect is the dominant claim.[62]

Plaintiffs must always prove a design defect and proximate cause, although jurisdictions differ on when a product is subject to suit because of the design.[63] Generally, the elements of a design defect claim are: (1) a dangerous defective condition, (2) the defect existed at time of sale, and (3) causation between the defendant's design and the plaintiff's injury.[64] The first element is subject to the

55. Ellen Edmonds, *AAA Finds Active Driving Assistance Systems Do Less to Assist Drivers and More to Interfere*, AAA NEWSROOM (Aug. 6, 2020), https://newsroom.aaa.com/2020/08/aaa-finds- active-driving-assistance-systems-do-less-to-assist-drivers-and-more-to-interfere/ [https://perma.cc/VYF7-XMWK].

56. *Id*.

57. *Id.*

58. *Id.*

59. *Design Defect*, BLACK'S LAW DICTIONARY (11th ed. 2019).

60. Pritchett v. Cottrell, Inc., 512 F.3d 1057, 1063 (8th Cir. 2008) (setting forth differences between Kansas and Missouri law); *see also* Potter v. Chi. Pneumatic Tool Co., 694 A.2d 1319, 1329 (Conn. 1997) ("[C]ourts have sharply disagreed over the appropriate definition of defectiveness in design cases.").

61. David G. Owen, *Design Defects*, 73 MO. L. REV. 291, 296 (2008).

62. *See id.*

63. *Pritchett*, 512 F.3d at 1063.

64. *See id.*

most differentiation, or even controversy. Courts differ on who carries the burden, plaintiff or defendant, and what test they must satisfy.[65]

The two most popular tests for design defect are the "consumer expectations" and the "risk-utility" tests.[66] Some courts use a combination of both.[67] The tests have the same ultimate goal: to assess whether the defendant's design is defective so as to impose legal liability.[68] However, the tests have different methods of determination and different scopes.

### A. *Consumer Expectations Test*

The consumer expectations test, in a nutshell, asks: does the product live up to the safety expectations of ordinary consumers? It is historically the most widely used test in the United States.[69] It is based upon the Restatement (Second) of Torts, section 402A, titled "Special Liability of Seller of Product for Physical Harm to User or Consumer," which provides:

> (1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if
>
> (a) the seller is engaged in the business of selling such a product, and
>
> (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.
>
> (2) The rule stated in Subsection (1) applies although
>
> (a) the seller has exercised all possible care in the preparation and sale of his product, and
>
> (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.[70]

65. *See* Owen, *supra* note 61, at 325–36.

66. *Id*. at 299.

67. *See, e.g.*, Mikolajczyk v. Ford Motor Co., 901 N.E.2d 329, 352 (Ill. 2008) (referring to this approach as an "integrated test").

68. *See id.* at 349.

69. *See* Jerry J. Phillips, *Consumer Expectations*, 53 S.C. L. REV. 1047, 1048 (2002) (describing consumer expectations as "probably the central test for determining a product defect."). *But see* William A. Dreier, *Consumer Expectations: A Defective Test for Design Defects*, KAN. J.L. & PUB. POL'Y 118, 119 (2000).

70. RESTATEMENT (SECOND) OF TORTS § 402A (AM. L. INST. 1965).

The text of the Restatement does not mention consumer expectations at all.[71] However, it comes from the comments following, which set forth contemplation by the ultimate consumer of the product as a guide.[72] Comment g defines a defective condition as "a condition not contemplated by the ultimate consumer, which will be unreasonably dangerous to him."[73] Additionally, "unreasonably dangerous" is defined as "dangerous to an extent beyond that which would be contemplated by the ordinary consumer who purchases it, with the ordinary knowledge common to the community as to its characteristics."[74] This standard is generally known as the consumer expectations test.[75] As one court articulated: "[A] plaintiff must demonstrate that a product 'failed to perform in the manner reasonably to be expected in light of its nature and intended function and was more dangerous than would be contemplated by the ordinary user having the ordinary knowledge available in the community.'"[76] The "test focuses on the expectation of [the product's] performance, [rather than] the technical considerations of the product."[77]

Although the consumer expectations test was developed in the context of manufacturing defects, it is consistently applied to design defects as well.[78] For example, in *Ford Motor Co. v. Trejo*, the plaintiff's surviving spouse alleged that the roof of the Ford Excursion at issue was defectively designed because it did not have enough reinforcement for the heavy weight of the SUV.[79] When the vehicle rolled, the passenger side of the roof was so crushed that the passenger could not be seen from the outside and he died at the scene.[80] A biochemical expert and a mechanical engineer testified as to how and when the roof was crushed.[81] The appellate court affirmed the verdict for the plaintiff, finding the jury weighed the credibility of the evidence and found the roof "failed to perform in a manner reasonably expected in light of its nature and intended function and was more dangerous than would be contemplated by the ordinary user having the ordinary knowledge available in the community."[82]

71. *See id.*
72. *Id.* cmt. g.
73. *Id.*
74. *Id.* cmt. i.
75. *See* Ford Motor Co. v. Trejo, 402 P.3d 649, 652 (Nev. 2017).
76. *Id.* at 652 (quoting Ginnis v. Mapes Hotel Corp., 470 P.2d 135, 138 (Nev. 1970)).
77. Hisrich v. Volvo Cars of N. Am., Inc., 226 F.3d 445, 455 (6th Cir. 2000).
78. *Id.*; Mikolajczyk v. Ford Motor Co., 901 N.E.2d 329, 342 (Ill. 2008).
79. 402 P.3d at 651–52.
80. *Id.* at 651.
81. *Id.* at 657.
82. *Id.* at 658.

Similarly, the Sixth Circuit Court of Appeals analyzed the consumer expectations test for vehicle designs in *Hisrich v. Volvo Cars of North America, Inc*.[83] A six-year-old child died following a rear-end collision at low speed after the airbag struck her forcefully, propelling her into the roof.[84] The child's mother brought a design defect suit against Volvo, the manufacturer of the vehicle, based on the design of the airbag system.[85] The appellate court found it was an abuse of discretion to deny the plaintiff's requested instruction on consumer expectations because "evidence of unexpected performance was presented at trial."[86]

Although historically the most used test, consumer expectations has gained critics.[87] Some opine that the test is too narrow.[88] A common critique is that it may not be applicable to all types of cases.[89] For example, if a product's defect or danger is obvious, then "consumer[s] can allegedly have no expectations of safety."[90] Similarly, if a product is complex, consumers are unlikely to have any expectations because the product would be "beyond the knowledge of the average person."[91] In other words, it can only be used in cases where "the *everyday experience* of the product's users permits a conclusion that the product's design violated *minimum* safety assumptions, and is thus defective *regardless of expert opinion about the merits of the design*."[92] These sentiments, in part, led to the adoption of an alternative test for determining design defects.

### B. *Risk-Utility Test*

The risk-utility test comes from the newer Third Restatement of Torts.[93] Simply put, the trier of fact determines whether the danger or risk outweighs the utility of the product at issue,[94] or whether "the utility of [an] alternative design outweighed the utility of the [one] actually used."[95] If so, then the product is

83. 226 F.3d 445, 455 (6th Cir. 2000).

84. *Id.* at 448.

85. *Id.*

86. *Id.* at 457 (reversing the lower court's rejection of the instruction and their reasoning that ordinary consumers would not know the technical considerations of an airbag system).

87. *See* Phillips, *supra* note 69, at 1048. *But see* Dreier, *supra* note 69, at 119.

88. *See* Drier, *supra* note 69, at 119.

89. *See id.* at 120.

90. Phillips, *supra* note 69, at 1048.

91. *Id.* at 1048–49. *But see* Ford Motor Co. v. Trejo, 402 P.3d 649, 655 (Nev. 2017).

92. Soule v. Gen. Motors Corp., 882 P.2d 298, 308 (Cal. 1994) (emphasis in original).

93. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 (AM. L. INST. 1998).

94. Calles v. Scripto-Tokai Corp., 864 N.E.2d 249, 257 (Ill. 2007).

95. Flemister v. Gen. Motors Corp., 723 So. 2d 25, 27 (Ala. 1998) (quoting *Ala. Pattern Jury Instructions: Civil*, Instruction No. 32.22 (2d ed. 1993)).

unreasonably dangerous and confers liability.[96] This test requires more review and analysis of the product's specifications.[97] Under this approach, a product:

> [I]s defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the alternative design renders the product not reasonably safe[.][98]

This test is intended to be "risk-utility balancing."[99] Again, the comments provide equal framework as the text. The drafters specifically reject consumer expectations as the sole adequate test for determining defects, finding it can be a factor but does "not play a determinative role."[100] Specifically, it may conflict with the reasonable alternative design requirement, and it is influenced by marketing of products to consumers.[101] In the view of the drafters, consumer expectations implicate important factors such as foreseeability or frequency of risk, but do not account for the costs or safety of reasonable alternative designs.[102] Consumer expectations cannot be an independent basis for recovery or denial of defective design claims, but it still has relevancy under the Third Restatement's approach.[103]

So, what is risk-utility balancing? It is a factored test to determine (1) "whether a reasonable alternative design would, at reasonable cost, have reduced the foreseeable risks of harm posed by the product and, if so, [(2)] whether the omission of the alternative design . . . rendered the product not reasonably safe."[104] This involves a comparison of the design of the product at issue with proposed alternative designs that allegedly would make the product safer.[105]

Comment f sets forth specific factors that may be considered in these two "risk-utility balancing" determinations, including:

> the magnitude and probability of the foreseeable risks of harm;
>
> the instructions and warnings accompanying the product;

96. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 (AM. L. INST. 1998).
97. *Compare id. with* RESTATEMENT (SECOND) OF TORTS § 402A (AM. L. INST. 1965).
98. RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 (AM. L. INST. 1998).
99. *Id.* cmt. a.
100. *Id.* cmt. b, g.
101. *Id.* cmt. g.
102. *Id.*
103. *See id.*
104. *Id.* cmt. d.
105. *Id.*

the nature and strength of consumer expectations regarding the product; including expectations arising from product portrayal and marketing;

advantages and disadvantages of the actual design and the alternative design;

effects of the alternative design on the longevity, maintenance, and repair of the product; and

the range of consumer choices among products.[106]

Not all factors set forth will be relevant in all cases.[107] Additionally, it is not an inclusive list, meaning more factors may be introduced or considered.[108]

Cases following risk-utility focus heavily on proving or disproving whether a reasonable alternative design existed at the time the allegedly defective product was manufactured.[109] This almost always requires an expert witness.[110] In *General Motors Corporation v. Jernigan*, upon collision, the right front structures of an Oldsmobile vehicle crushed inward, causing a passenger to strike his head and sustain permanent brain damage.[111] Plaintiffs called a biomechanics expert witness, who testified that if there had been six to eight more inches of space in the passenger area, there would have been a softer impact, or an impact would have been avoided entirely upon collision.[112] Further, plaintiffs introduced as evidence other vehicle designs with stronger front-end structures.[113]

In *Soule v. General Motors Corporation*, the plaintiff sustained serious injuries when the front driver bracket of the Camaro she was driving caused the wheel and toe pan to collapse inward and rearward toward her ankles.[114] As a reasonable alternative design, the plaintiff introduced the design of the Ford Mustang, and asserted it provided more protection.[115]

*Mikolajczyk v. Ford Motor Company* is a good example of the risk-utility balancing of factors with respect to a reasonable alternative design.[116] The plaintiff's suit was based, in part, on defective design of the driver's seat of the

106. *Id.* cmt. f.
107. *Id*.
108. *Id*.
109. *See e.g.*, Gen. Motors Corp. v. Jernigan, 883 So. 2d 646 (Ala. 2003).
110. *See e.g.*, *id.*
111. *Id.* at 650.
112. *Id.* at 656.
113. *Id.* at 660.
114. 882 P.2d 298, 301 (Cal. 1994).
115. *Id.* at 302.
116. *See generally* 901 N.E.2d 329 (Ill. 2008).

Ford Escort—specifically that it collapsed upon collision, causing the decedent to be propelled and strike his head.[117] The design at issue and the alternative design to be compared were a "yielding" seat and a "rigid" seat.[118] The factors considered were: the effect the alternate design would have, the foreseeability of rear-end collisions, and the expectation that a seat would not collapse.[119]

The risk-utility analysis is supposed to be more flexible and balance the competing interests of consumers and manufacturers.[120] However, some criticize it as being too large of a burden for plaintiffs.[121] Reasonable alternative design is often a high burden of proof.[122]

Jurisdictions are increasingly embracing or adopting the risk-utility analysis, although they are continuing to recognize consumer expectations.[123] Some jurisdictions have continued to hold that consumer expectations is the dominant test to be used, rejecting risk-utility analysis.[124] Some courts have created their own unique analysis.[125] For example, some purport to follow the Third Restatement's risk-utility approach, but do not require proof of a reasonable alternative design.[126]

As of 2015, fifteen states followed the consumer expectations test, eighteen followed the risk-utility analysis, nine could follow either one, six remained unclear, and two were alternate approaches.[127]

## V. APPLICATION TO AUTOMATED VEHICLES: HOW WILL COURTS ASSESS LIABILITY FOR DESIGN DEFECTS IN THESE PRODUCTS?

### A. *Consumer Expectations*

We know automated vehicles are increasing in production and popularity, and that more accidents involving automated vehicles are occurring. It is only a

117. *Id.* at 333.

118. *Id.*

119. *Id.* at 352–53.

120. Cami Perkins, *The Increasing Acceptance of the Restatement (Third) Risk Utility Analysis in Design Defect Claims*, 4 NEV. L.J. 609, 610 (2004).

121. *Id.* at 613.

122. *Id.*

123. *See id.* at 610–12.

124. *See, e.g.*, Ford Motor Co. v. Trejo, 402 P.3d 649, 650–51 (Nev. 2017).

125. Perkins, *supra* note 120, at 620–23.

126. *Id.* at 609.

127. Mike McWilliams & Margaret Smith, *An Overview of the Legal Standard Regarding Product Liability Design Defect Claims and a Fifty State Survey on the Applicable Law in Each Jurisdiction*, 82 DEF. COUNS. J. 80, 83–90 (2015).

matter of time before courts are faced with an automated vehicle as the subject of a design defect products liability suit. What test will they apply? Will the consumer expectations test work with these products, or be insufficient? Is the risk-utility analysis any better?

An obvious answer is that the test applied will depend on the jurisdiction and what approach they have adopted. However, it is likely that analysis under either test would fall short.

Under a consumer expectations test, we face concerns with the complexity of the product. As previously discussed, automated vehicles have complex designs with interconnected electronics.[128] Consumers may be able to understand cameras and sensors, but likely not algorithms, codes, etc.[129]

Certainly, if courts are concerned with the complexity of general, human-operated vehicles under consumer expectations, then automated vehicles will pose an even greater concern.[130] Consumers do not have much knowledge of, or experience with, automated vehicles; even those who do have experience will likely not be able to understand the complex and intricate structures. For this test to work, consumers must have some contemplation of it—some ordinary knowledge of its characteristics.[131] Most people in a given community will not have owned, experienced, or even seen an automated vehicle of any level.[132] This is worsened by the fact that these products are expensive and not affordable to a majority of citizens.[133]

For these reasons, I anticipate that the consumer expectations test will not be adequate to apply to automated vehicles. It is possible that the test could apply in the future, when these products are more prevalent, and consumers have more knowledge of them. However, I recognize that products liability cases often contain complex or unique products, and courts and juries have been able to comprehend them enough to render a verdict.

128. *See supra* Part II.

129. *See, e.g.,* BARR, *supra* note 10 (attempting to break down the code behind Toyota's software to explain how it was defectively designed).

130. *See, e.g.*, Soule v. Gen. Motors Corp., 882 P.2d 298, 302 (Cal. 1994); Phillips, *supra* note 69, at 1048–49.

131. Phillips, *supra* note 69, at 1055.

132. *See* Ashley Nunes & Kristen Hernandez, *The Cost of Self-Driving Cars Will Be the Biggest Barrier to Their Adoption*, HARV. BUS. REV. (Jan. 31, 2019), https://hbr.org/2019/01/the-cost-of-self-driving-cars-will-be-the-biggest-barrier-to-their-adoption [https://perma.cc/HY5K-KPJM].

133. *See id.*

Marketing could be an important factor with the consumer expectations test and automated vehicles.[134] How a product is advertised and marketed certainly influences consumer's expectations of that product, and is a factor that is considered in consumer expectation design defect suits.[135] These vehicles are often marketed as "driverless" or "hands-off" products.[136] So, it is not unusual for drivers of automated vehicles to act more like passengers, or for consumers to think it is an expectation that they can do so.[137] For example, advertisements have shown the driver singing along to music and tapping their hands on their lap and passenger seat.[138] My prediction is that courts will not be sympathetic to manufacturers of automated vehicles.

### B. *Risk-Utility Analysis*

Similar issues will also be present under risk-utility analysis. However, under risk-utility analysis, the knowledge and experience of consumers is less relevant or determinative.[139] Therefore, it is more likely that jurors who are unfamiliar with these products can take the evidence in the case, and the jury instructions—with the risk-utility factors—and render a sound verdict.

One of the issues that would surface under a risk-utility analysis is that, if required, reasonable alternative designs would be harder to prove. Since the products are still essentially in their infancy, and many are vastly different, it would be difficult for plaintiffs to find a reasonable alternative design to present that could render the defendant's design unreasonably dangerous. Even if they existed, it would be difficult and costly to locate them and understand them enough to present a logical argument to persuade the jury.

Virtually all—but especially reasonable alternative design cases—require expert testimony. It would also be difficult and costly for plaintiffs to locate and hire experts in these products.

## VI. CONCLUSION

The term *automated vehicle* is an inclusive term encompassing the advanced technology in the automotive industry. The products were once a far-off idea but

134. *See* Mikolajczyk v. Ford Motor Co., 901 N.E.2d 329, 352 (Ill. 2008).

135. *Id.*

136. *See America's Most Toxic Car Ads: 'Autonomous' Atrocities*, STREETSBLOG USA (Sept. 27, 2021, 12:01 AM), https://usa.streetsblog.org/2021/09/27/americas-most-toxic-car-ads-autonomous-atrocities/ [https://perma.cc/RJD8-DFQD].

137. Clifford Law, *supra* note 37, at 1.

138. *See* CBS Mornings, *supra* note 1.

139. *See* RESTATEMENT (THIRD) OF TORTS: PRODS. LIAB. § 2 cmt. h, g (AM. L. INST. 1998).

are now a reality and steadily increasing in prevalence in our technological and efficient society—although still in their infancy. Today, a wide range of products under this label exist, from corrective assistance to fully automated personal and commercial vehicles.[140]

With automated vehicle products on the streets, courts and practitioners need to be prepared for the inevitable event of product liability suits—especially considering the outcomes with these products thus far.[141]

Anticipating how courts will respond starts with the existing frameworks. Today, courts generally use the consumer expectations test and the risk-utility test. The consumer expectations test assesses whether the product lives up to the safety expectations of consumers with their general knowledge and experience of the product. The risk-utility test uses a myriad of factors to determine if a reasonable alternative exists, and if the manufacturer-defendant's failure to use that alternative design renders its product unreasonably safe.

Considering these tests in the context of an automated vehicle design defect case emphasizes the critiques of each. For example, the consumer expectations test does not always work well with all types of products, including complex or unique ones that consumers do not have experience with or knowledge of. Certainly, autonomous vehicles fit into that description—at least in today's society. A risk-utility test in the context of automated vehicle design would make it difficult for plaintiffs to bring suit and then ultimately succeed because of the costs, intricacies of the product, and the lack of available alternative designs for proof.

It is this Author's opinion that both tests will be extremely difficult to work with in an automated vehicle design defect case. I predict that courts will not be sympathetic to the manufacturers of these products. Ultimately, I opine that risk-utility would be the most feasible option at this point, and consumer expectations and marketing should remain an important factor in that analysis. However, cases will get easier over time if automated vehicles are used more by consumers and more resources become available.

*Jordan Reed**

140. *Automated Vehicles for Safety*, *supra* note 21.

141. *See* Edmonds, *supra* note 55.

*J.D., Drake University Law School. Attorney at Durick Tuttle Smith PLC.