R2DFord: Autonomous Vehicles and the Legal Implications of Varying Liability Structures

Alexander P Herd, American University Washington College of Law
R2DFord: Autonomous Vehicles and the Legal Implications of Varying Liability Structures

Option IV

Note and Comment Editor

Mohammad Nilforoush
Abstract

The World Health Organization estimates that by 2030, traffic accidents will be the fifth leading cause of death in the world. Thus when Google announced that it had designed an autonomous car which could reduce traffic accidents by as much as ninety percent, there was cause for excitement. Some states have already started legislation to permit the use of autonomous cars in anticipation of the release later this decade. Courts and lawmakers need to consider who will be liable when the car that drives itself crashes. Standards used in aviation and naval cases regarding auto-pilot can be applied to the more advanced technology behind autonomous cars using the pilot in command regulations. Products liability standards such as the consumer expectations and risk-utility tests may also provide guidance. The complex nature of the autonomous system and the differences between a pilot using auto-pilot and a driver allowing the car to drive itself make the pilot in command and consumer expectations standard less than ideal. This Comment argues that the flexibility and balance from the risk-utility test is the most usable fit for the autonomous car.
Contents

I. Introduction .............................................................................. 1

II. Back to the Future: Current Laws Affecting Liability for the Autonomous Automobile .......................................................... 7
   A. The Technology Behind the Autonomous Car and the Economic Impact it Could Have ......................................................... 7
   B. Initial Lawmaker Response to the Google Car and Issues of Legality .................................................................................. 11
   C. Consumer Expectations and Risk-Utility Standards ............... 16
   D. Aviation and Naval Guidelines for Auto-Pilot ...................... 22

III. How the Available Standards can be Applied to the Autonomous Car ................................................................................. 29
   A. Applying Consumer Expectations: What to Expect When You’re Expecting a New Technology .............................................. 30
   B. Risk-Utility Applied: Discussing the Benefits of Applying the Standard .................................................................................. 38
   C. For the Autonomous Car does Aviation Law Fly or Can Naval Standard Anchor the Analysis? .................................................... 46

IV. Courts and Lawmakers Should Consider the Purpose of an Autonomous Car and the Impact on Society When Deciding Which Standard to Apply ........................................................................... 52
   A. In a Perfect World: Potential Societal Impacts of a World Filled with Autonomous Cars and How Each Standard of Liability has an Impact .................................................................................. 53
B. The Risk-Utility Standard is the Most Suitable for the Intent Behind the Autonomous Car ............................ 56

V. Conclusion ......................................................... 60


I. Introduction

What if there was a car which saved money on gas, kept occupants safer, and gave the driver more free time from commuting? This dream might be only a few years away from becoming a reality.¹ In 2010, Google announced that the era of the autonomous car was quickly approaching.² Google believes the introduction of their cars can significantly cut down on the number of accidents, car usage, and energy consumption.³ The company even predicted that they may be able to cut the number of traffic fatalities worldwide by half, and by some estimates even up to ninety percent.⁴

¹ See Sebastian Thrun, What We're Driving At, Official Google Blog (Oct. 9, 2010, 12:00 PM), http://googleblog.blogspot.com/2010/10/what-were-driving-at.html (describing the benefits of an autonomous car such as cutting down on highway deaths, energy consumption, and commute time).

² See id. (explaining the use of autonomous vehicles and the testing they have undergone).

³ Id.

⁴ See Thrun, supra note 1 (predicting that autonomous cars will make a huge impact on the safety of the 1.2 million people reported to be killed by road traffic accidents each year.

1
While it will still likely be a few years before the autonomous car is sold to consumers, those interested in the technology are already beginning to think about who would be liable if a car driven by a computer gets into an accident. One suggestion is to apply current aviation law to the driver of an according to the World Health Organization); Chunka Mui, Fasten Your Seatbelts: Google’s Autonomous Car is Worth Trillions, Forbes (January 22, 2013), http://www.forbes.com/sites/chunkamui/2013/01/22/fasten-your-seatbelts-googles-autonomous-car-is-worth-trillions/ (quoting Google developer Sebastian Thrun who claimed the car can reduce up to ninety percent of automobile accidents).

5 See Andrew Garza, "Look Ma, No Hands!": Wrinkles and Wrecks in the Age of Autonomous Vehicles, 46 New Eng. L. Rev. 581, 583 (2012) (clarifying that at the time of the article’s publication, the technology would likely not be available for another eight years).

autonomous vehicle.\(^7\) Others believe that products liability standards which already exist, such as the consumer expectations or the risk-utility tests, can be applied to autonomous technology.\(^8\) Aviation standards may make assigning liability significantly easier but could require the car to be used in ways other than how Google intended.\(^9\) However, products


\(^8\) See generally Garza, supra note 5 (arguing that there is no need to create new standards for an autonomous vehicle since existing products liability standards are equipped to deal with such technology).

\(^9\) See Krasnow Waterman & Matthew Hensshon, Imagine the Ramifications, SciTech, 2009 at 15 (contrasting auto-pilot, which is engaged mainly during take-offs and landings with autonomous cars, where the technology would be used throughout the entire trip).
liability tests may not be applicable to autonomous vehicles until they have been on the market for a number of years.\textsuperscript{10}

Currently, three states have already approved legislation to allow the Google autonomous car on the roads as well as to begin a process to incorporate the car into current vehicle codes.\textsuperscript{11} California’s law mandates that the state’s Department of Motor Vehicles must have regulations in place for autonomous cars no later than 2015.\textsuperscript{12} While more states will need to pass similar legislation for the car to be successful, it is likely that the current traffic regulations set forth by the Geneva Convention, National Highway Safety Administration, and state

\begin{flushright}
\textsuperscript{10} See Garza, supra note 5, at 600-02 (explaining that consumers must be familiar with a technology for some time before the consumer expectations test may be used and data related to the safety of the technology is required for the risk-utility test).
\textsuperscript{12} Cal. Veh. Code § 38750(d).
\end{flushright}
codes would not prohibit the use of an autonomous car. However, states will need to make room in their codes for the autonomous car to avoid complicating the process for courts.

The decision that lawmakers or courts make for assigning liability could have huge ramifications on decisions Google makes on what could be a trillion dollar product. Google may need to consider offering training to drivers on the proper use of the autonomous system. To prepare for suits that arise out of system malfunctions, Google may also need to show data to

13 See Bryant Walker Smith, Automated Vehicles are Probably Legal in the United States, Center for Internet and Society at Stanford Law School (Nov. 1, 2012) (concluding that there are currently no laws or regulations preventing the use of autonomous cars).

14 See id. (explaining that although state vehicle codes should not prevent the autonomous car from being used, they will complicate things for courts in their current form).

15 See Mui, supra note 4 (implying that the introduction of the autonomous car could affect businesses by trillions of dollars).

16 See generally Glorvigen v. Cirrus Design Corp., 796 N.W.2d 541 (Minn. Ct. App. 2011) (examining the responsibility of an auto-pilot manufacturer to provide training on how to use the technology to pilots).
support that the benefits of the autonomous car outweigh any potential safety hazards.\textsuperscript{17}

This Comment analyzes the result of applying different liability structures to the use of an autonomous car. Section II summarizes the consumer expectations and risk-utility tests used in products liability law. The section then discusses the existing standards for auto-pilot used by planes and boats including the pilot-in-command FAA regulation. Next, in Section III, this Comment examines how a consumer expectations test can be applied to the Google car and what ramifications come from using the test. This section also describes the protocol for applying the risk-utility test to an autonomous car, and explains the steps both the plaintiff and Google would need to take during a suit. Next, the the pilot in command rule and other aviation protocols are applied to the autonomous vehicle. Finally, in Section IV, this Comment argues that the risk-utility standard results in the best outcome for drivers and

\textsuperscript{17} See Patrick J. Norton, \textit{What Happens when Air Bags Kill: Automobile Manufacturers’ Liability for Injuries Caused by Air Bags}, 48 \textit{Case W. Res.} 659, 687-88 (1998) (illustrating that the best way for a manufacturer to defend a risk-utility claim is by providing data which supports the idea that the feature is safe.)
does not free manufacturers from all responsibility for their product.

II. Back to the Future: Current Laws Affecting Liability for the Autonomous Automobile

This section explains the technology used in the Google car and how its design gives many benefits to drivers. Then, it discusses the state lawmakers’ reaction to the announcement of an autonomous car and as well as the legality of the autonomous car under current United States law. Finally, this section summarizes and explains the standards used in aviation and naval law, as well as the consumer expectations and risk-utility tests.

A. The Technology Behind the Autonomous Car and the Economic Impact it Could Have

After initially keeping the technology a secret, Google revealed how the autonomous car is able to drive without human control.\(^\text{18}\) The heart of the system is a laser positioned on the

roof of the car which creates a 3-D map of the environment.\textsuperscript{19} This image is then combined with high resolution maps programmed into the car.\textsuperscript{20} The car is also equipped with four radars used for far-sighted vision on the freeways, as well as a camera for monitoring stop lights.\textsuperscript{21} In order to monitor where the car goes, it is equipped with GPS, an inertial measurement unit, and wheel encoder.\textsuperscript{22}

In order to help the car differentiate pedestrians from other stationary objects, Google engineers drive along a route to gather data about the environment.\textsuperscript{23} Then, the car travels the same route and compares the new data with the previous data which allows it to determine if a pedestrian is present.\textsuperscript{24}


\textsuperscript{20} Id.

\textsuperscript{21} Id.

\textsuperscript{22} Id.

\textsuperscript{23} See Guizzo, supra note 18 (describing the process by which engineers accumulate data so that the car is able to adjust to a changing environment).

\textsuperscript{24} See id. (elaborating on the way the car interprets data).
car is also programmed to behave more aggressively in certain conditions, including inching forward to show intention.\textsuperscript{25} Despite the many technological features, certain conditions, such as ice or very heavy rain, may make the car unable to use the technology.\textsuperscript{26} If this happens, the car will alert the driver that it cannot use the autonomous technology to drive and the driver must take over and operate the vehicle on his own.\textsuperscript{27}

The excitement surrounding the technology has already begun to build, but there is the potential for enormous social impacts.\textsuperscript{28} Sebastian Thrun, lead developer of the Google car,

\textsuperscript{25} See id. (detailing that the car is capable of reading the situation and signaling to other drivers if necessary).

\textsuperscript{26} See Google Asks, Why Should a Car Need a Driver, \textit{NPR} (Oct. 11, 2010), http://www.npr.org/templates/story/story.php?storyId=130492972 [hereinafter \textit{Google Asks}] (stating that extreme weather conditions have been shown to interfere with the car’s ability to use the autonomous technology).

\textsuperscript{27} See id. (explaining that the car will alert the driver when unfavorable conditions prevent the car from driving accurately).

\textsuperscript{28} See Mui, \textit{supra} note 4 (predicting that the introduction of an autonomous car to the market will likely lead to large changes that have economic and social ramifications).
claims the car could result in reducing traffic accidents by 90%, reducing wasted commute time and energy by 90%, and reducing the number of cars by 90%.29 In 2009, car crashes contributed to over 33,000 people deaths and two million injuries in the United States.30 The American Automobile Association estimated the total cost of automobile accidents in the 99 largest U.S. urban areas to total $299.5 billion which would suggest costs of around $450 billion for the entire country.31

If Google’s claims are accurate, the autonomous car would save 30,000 lives and prevent an additional two million injuries while cutting expenses by at least $400 billion a

29 See id. (quoting Thrun’s claims about the benefits of producing the autonomous car).


31 See id. at ES-2 (revealing the findings of the report as to how much money is attributed to automobile accidents each year); Mui, supra note 4 (extrapolating the data for the top 99 urban cities to apply to the rest of the country).
Improved safety on the roads is a huge concern as the World Health Organization (WHO) estimates that by 2030 traffic injuries will become the fifth leading cause of death worldwide, accounting for 3.6% of total deaths. With a product that could save billions of dollars worldwide, knowing how to best prepare for potential liability is vital to how Google conducts business.

B. Initial Lawmaker Response to the Google Car and Issues of Legality

Before the autonomous cars can be purchased by consumers, lawmakers need to determine if operating the car is legal. To answer this question, the Geneva Convention, National Highway Traffic Safety Administration regulations, and state vehicle

---

32 See Mui, supra note 4 (applying Google’s claims of ninety percent less accidents to the data on traffic accident deaths and expenses).

codes need to be analyzed. The Geneva Convention, which the United States is a party to, establishes uniform rules for road safety, one of which requires every vehicle to have a driver who is “at all times . . . able to control it.” The National Highway Traffic Safety Administration regulations dictate that vehicles must possess a driver operated flasher capable of alerting other drivers to the presence of a hazard. Specific state codes are designed around the presence of human drivers who exercise judgment and many codes mandate reasonable, prudent, practicable, and safe driving. New York’s code even specifically requires drivers to keep one hand on the wheel at

34 See generally Smith, supra note 13 (analyzing existing laws to determine if an autonomous car would be legal to operate in the United States).


36 49 C.F.R. § 571.108 tbls. I, III.

37 See Smith, supra note 13, at 3 (discussing the assumptions state laws make regarding a human driver that can make decisions behind the wheel but ultimately concluding that these codes could be applied to autonomous cars in their current form).
all times. \(^{38}\) Lawmakers would need to consider altering the vehicle code to accommodate autonomous cars or finding ways to apply the existing code to the autonomous car. \(^{39}\)

As people hear of the development of the autonomous car, questions arise as to whether the technology is truly a benefit or too good to be true. \(^{40}\) Rather than waiting to find out, some state lawmakers have been working to quickly get laws in place to allow autonomous cars. \(^{41}\) In September of 2012, California

\(^{38}\) N.Y. Veh. & Traf. Law § 1226.

\(^{39}\) See Smith, supra note 13, at 3 (recommending that state codes be amended to use vocabulary which is more applicable to an autonomous car to more clearly relate to a car with no human operator).

\(^{40}\) See Aaron Saenz, Google's New Robot Car Raises Hopes, Reality Will Dash Them Soon, Singularity Hub (Oct. 11, 2010), http://singularityhub.com/2010/10/11/googles-new-robot-car-raises-hopes-reality-will-dash-them-soon (opining that although the Google car may bring positive changes, the high expectations many have are not realistic).

\(^{41}\) See Claburn, supra note 11 (noting the three states which have already passed legislation to make an autonomous car legal to drive as well as the two states which are discussing similar legislation).
passed legislation that allows autonomous cars to operate on state roads. California followed in the footsteps of Florida and Nevada which both passed laws within the past two years. The California law requires the Department of Motor Vehicles to create specific regulations by 2015, but it is already known that one such regulation will require a licensed driver behind the wheel.

Not all states have been as eager to accept the autonomous car. Arizona was debating legislation which would establish guidelines for the autonomous car before determining that the

42 See id. (dictating the process which led to California passing new legislation); Cal Veh Code § 38750(d).
43 See id. (acknowledging that Florida and Nevada’s were first to pass similar legislation allowing the use of autonomous car).
44 See Cal Veh Code § 38750(d) (laying out requirements for creation of regulations set forth by the Department of Motor Vehicles).
issue of liability in case of a crash was uncertain.\textsuperscript{46} Although it is unknown what types of regulations the Department of Motor Vehicles may implement, the lawmakers seemed to rely on information that the autonomous cars are a safer option.\textsuperscript{47} One study showed that introducing autonomous crash-avoidance systems could reduce the number of vehicle crashes by up to 81%.\textsuperscript{48} The only reported incidents with the Google cars have been attributed to human error, not to the system directing

\begin{footnotesize}
\begin{enumerate}
\item See id. (elaborating that many manufacturers are concerned that consumers may attempt to modify the technology which may cause a malfunction and leave the manufacturers liable for injuries).
\item See Claburn, supra note 11 (remarking that supporters of the autonomous car argue that it is safer than a manually driven car).
\item See Wassim G. Najm, Jonathan Koopmann, John D. Smith, and John Brewer, U.S. Dept. of Transportation, DOT-HS-811-381, Frequency of Target Crashes for IntelliDrive Safety Systems 15 (2010) (finding that the use of two different types of crash avoidance systems could prevent up to 81% of vehicle crashes).
\end{enumerate}
\end{footnotesize}
the car. This is good news for Google who has accumulated over 300,000 miles of testing with the cars, the last 50,000 of which was completed without an engineer taking the wheel. Google co-founder Sergey Brin believes that the technology may be available for the public as early as five years from now. It will be important for courts or lawmakers to determine how to assess liability when autonomous cars are involved in accidents.

C. Consumer Expectations and Risk-Utility Standards

The two most common tests a court will use when determining if a product is defective are the consumer expectations test and the risk-utility test. The consumer expectations test is

49 See Weinberger, supra note 6 (describing a report that a Google car got into an accident but indications were it was human error that led to the crash, not the system of the car).

50 See Claburn, supra note 11 (echoing the fact that the Google cars have undergone the latter portion of the testing without human control).

51 See id. (expressing Google co-founder Sergey Brin’s hopes that the technology will be publically available sooner than expected).

52 See Garza, supra note 5, at 600 (explaining that plaintiffs who bring suit for manufacturing defects will rely on consumer expectations and risk-utility tests).
designed to test if the danger that stems from the design is greater than an ordinary consumer would expect when using the product in a reasonably foreseeable manner. A requirement of the test is that a consumer must have sufficient knowledge of the design of a product to develop expectations about the performance or safety. However, just because a technology is complex does not mean that courts will not allow the use of a consumer expectations test. If consumers use a product frequently enough, the consumer expectations test may still be used to provide useful guidance. In Bresnahan v. Chrysler

53 See id. at 591 (summarizing the standard used in the consumer expectations test and elaborating that the standard makes it more challenging to apply the test to more complex products).

54 See id. at 591-92 (indicating that a consumer may be justified in a belief that a car should not explode at a stop light or catch fire in a two-mile-per-hour collision but may not have a reasonable expectation of how a truck will react when striking a rock at thirty-five-miles-per-hour).

55 See Jackson v. GMC, 60 S.W.3d 800, 806 (Tenn. 2001) (holding that the court will not preclude the use of the consumer expectations test simply because a technology is complex).

56 See id. (interpreting the consumer expectations test to apply based on minimum safety expectations from a consumer with common
the court determined that the fact that a consumer did not have everyday experience with an air bag did not bar the use of the consumer expectations test because that would be the case with any safety equipment that was triggered. Instead, the court believed that the consumer would be capable of forming an expectation about whether the highly publicized and commonplace product of an air-bag satisfied minimal safety expectations.

However, the consumer expectations test has been criticized as having some flaws. The court in Pruitt v. General Motors

knowledge about the product as opposed to how complex the product may be).


See id. at 1567-68 (refusing to bar the consumer expectations test just because consumers may not be familiar with how the technology works).

See id. at 1567 (discussing the minimum amount of knowledge necessary for the consumer expectation test to be used).

See Robert Dan Spendlove, Speed Bumps on the Road to Progress: How Product Liability Slows the Introduction of Beneficial Technology – An Airbag Example, 13 Geo. Mason L. Rev. 1143 (2006) (acknowledging that the consumer expectations test is not widely used and does not have the same success in courts that the risk-utility test does).
Corp.\textsuperscript{61} found that the consumer expectations test could not be used when determining if an air bag malfunction was due to a manufacturer defect.\textsuperscript{62} The court determined that the complex issues involved in an airbag case would bar the consumer expectations test from being used.\textsuperscript{63}

As an alternative to the consumer expectations test, the Supreme Court of California created the risk-utility test in Barker v. Lull Engineering Co.\textsuperscript{64} In Barker, the plaintiff was injured when diving out of a piece of equipment known as a loader when it began to tip.\textsuperscript{65} The plaintiff based his claim on the loader lacking outriggers which could have prevented it from

\begin{footnotesize}
\begin{itemize}
  \item \textsuperscript{61} 86 Cal. Rptr. 2d 4th 1480.
  \item \textsuperscript{62} See id. at 1483-84 (reasoning that the deployment of an air bag is not an everyday experience so the consumer could not develop minimum expectations about the safety of the product).
  \item \textsuperscript{63} See id. (pointing to the testimony of the expert witness who discussed complex tradeoffs when creating an air bag that the average person would not understand).
  \item \textsuperscript{64} See Barker v. Lull Engineering Co., 20 Cal. 3d 413, 418 (Cal. 1978)(introducing the risk-benefit standard by which a plaintiff can show a product was defective).
  \item \textsuperscript{65} See id. at 419 (describing the facts of the case which involved the plaintiff being injured on the job).
\end{itemize}
\end{footnotesize}
tipping. The court determined that there were two ways in which a product could be shown to be defective. The first is the consumer expectations standard and the second was what the court referred to as a “risk-benefit” standard.

The risk-utility test also comes from the Restatement (Third) of Torts which was written to include a balancing effect. The Restatement declares a product design to be defective if the “harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design.” In Watson v. Ford Motor Co., the Supreme Court of

---

66 See id. at 420 (clarifying that outriggers were optional equipment for loaders which plaintiff’s expert witness testified would likely have prevented the accident from occurring).

67 See id. at 418 (summarizing prior case law for products liability which resulted in two methods of proving liability).

68 See id. (elaborating that the risk-benefit method requires the plaintiff to show that the benefits of the manufacturer’s design do not outweigh the risk of danger inherent in the design).

69 See Restatement (Third) of Torts: Products Liability § 2(b) (1998)(detailing that a product is defective when it could have been made more safe through reasonable efforts but was not).

70 Id.

71 699 S.E.2d 169 (2010).
South Carolina followed the approach in the restatement by requiring expert testimony and using the risk-utility method when dealing with a claim against a defective technology.\textsuperscript{72}

Under the risk-utility standard, when a plaintiff is able to make a prima facie showing that his injuries were a proximate cause of the product’s design, the burden shifts to the defendant to prove that the product is not defective.\textsuperscript{73} Even if the manufacturer is able to demonstrate that they took reasonable precautions to design a safe product or acted in a reasonably prudent manner, it does not preclude holding the manufacturer strictly liable if the trier of fact concludes that the product’s design is unsafe.\textsuperscript{74}

\begin{itemize}
  \item \textsuperscript{72} See id. at 177 (noting that the court elected to follow the restatement’s approach)
  \item \textsuperscript{73} See Barker 20 Cal. 3d 413 at 431 (concluding that a manufacturer who wishes to escape liability from the risk-benefit standard will bear the burden of proof in explaining why the particular product design was used).
  \item \textsuperscript{74} See id. at 434 (distinguishing strict liability from negligence).
\end{itemize}
D. Aviation and Naval Guidelines for Auto-Pilot

Some have suggested that courts should look to aviation law when analyzing the autonomous car.\(^75\) FAA regulations require the pilot to be responsible for the safe operation of the aircraft at all times.\(^76\) The auto-pilot system installed in planes and ships operates by keeping the vehicle at the same altitude when on a plane, or the same heading when on a ship.\(^77\) The technology is not designed to adjust to a changing environment or adjust the course of the vehicle without input from a human controller.\(^78\) Due to this design, auto-pilot is often viewed as a guide for the operator, not a technology which is capable of controlling the vehicle on its own.\(^79\)

\(^{75}\) See Strochlic, supra note 7 (expressing that modeling laws for autonomous cars off existing FAA regulations makes sense).

\(^{76}\) See U.S. FAA FAR §91.3 (mandating that the pilot is responsible for any actions taken on the aircraft at all times).

\(^{77}\) See Waterman & Hansshon, supra note 9, at 14 (describing the purpose of an auto-pilot system on an airplane or boat).

\(^{78}\) See id. (contrasting the abilities of the technology of an autonomous car with the auto-pilot).

\(^{79}\) See Belger v. Moore, NTSB Order EA-4992, Docket SE-16318, 9 (N.T.S.B. Aug. 27, 2002) (rejecting defendant’s argument that the auto-pilot let him down because responsibility to fly the plane
In Belger v. Moore, the National Transportation Safety Board was presented with a case where the pilot of an airplane flew too close to another airplane and argued that he reasonably relied on the equipment on the plane which caused him to fly too close.\textsuperscript{80} The Board disagreed with this argument because the equipment is intended to assist the pilot, not take over his responsibility for the aircraft.\textsuperscript{81} The pilot is responsible for any actions the plane takes and cannot shift the blame to the equipment for failing to fly in a safe manner.\textsuperscript{82} The Board explained in a later case that a pilot’s responsibility is to correctly cannot be transferred from the pilot to the equipment).

\textsuperscript{80} See id. 8-9 (summarizing defendant’s argument where he believed the auto-pilot caused him to fly within 860 feet of another plane).

\textsuperscript{81} See id. at 9 (explaining that the board has held on many occasions that technology on a plane is there for guidance, not to be in control).

\textsuperscript{82} See id. at 9-10 (dictating that pilots are held to the highest degree of care and failing to properly monitor equipment does not reach this standard).
monitor the equipment and adjust the plane if it is not on course.\textsuperscript{83}

Cases in which auto-pilot systems have failed or malfunctioned are often passed off as human error on behalf of the operator of the vehicle.\textsuperscript{84} In \textbf{Beverly Richardson v. Bombardier}, a pilot turned the auto-pilot on before going to the lavatory.\textsuperscript{85} The plane hit a wind gust which caused it to gain altitude but the auto-pilot overcorrected and sent the plane


\textsuperscript{84} See Beverly Richardson v. Bombardier, 2005 U.S. Dist. LEXIS 30025, 56 (U.S.D.C., M.D.Fla.)(concluding that the crash was a result of the plane being improperly loaded not the auto-pilot malfunction); \textit{In re Korean Air Lines Disaster}, 156 F.R.D. 18, 21 (1994 U.S. District LEXIS 10123)(determining that the crash was not due to a malfunction but rather the pilot failing to notice the auto-pilot was left in heading mode).

\textsuperscript{85} See \textbf{Beverly Richardson} 2005 U.S. Dist. LEXIS 30025 at 5 (disclosing that when the pilot went to the lavatory, the plane had the auto-pilot engaged and was traveling at an altitude of 9,000 feet).
into a dive, causing it to crash.\textsuperscript{86} The court concluded that the crash was a result of human error, not auto-pilot malfunction, because the plane was designed with a poor center of gravity.\textsuperscript{87}

In another case involving auto-pilot, the pilot of Korean Air Lines Flight 007 set the autopilot but did not oversee that the plane was on course.\textsuperscript{88} The plane drifted 360 miles into restricted Soviet air space and was shot down by the Soviet military.\textsuperscript{89} A court found that since the flight crew was aware of the dangers of going off course and the plane had deviated so far from its intended path that the crew lacked situational awareness, their conduct amounted to willful misconduct.\textsuperscript{90} As a result, the court determined the drifting was most likely a

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{86} See \textit{id.} at 5-6 (adding that fifty seconds after the pilot left the cockpit, a gust caused the plane to move and the auto-pilot overcorrected sending it into a dive).
\item \textsuperscript{87} See \textit{id.} at 6 (finding that there was not enough evidence to conclude auto-pilot malfunction was to blame since the plane had a poor center of gravity).
\item \textsuperscript{88} See \textit{Korean Air Lines Disaster} 156 F.R.D. at 20 (summarizing the facts where the pilots were flying near Soviet territory).
\item \textsuperscript{89} See \textit{id.} at 19-20 (informing on the nature of the crash).
\item \textsuperscript{90} See \textit{id.} at 20 (discussing the jury verdict from a 1989 case which found human error to be at fault for the crash).
\end{itemize}
\end{footnotesize}
result of a navigational error in entering coordinates and did not consider the auto-pilot to be at fault for the incident.\textsuperscript{91}

Courts have also been faced with what to do when a plane crash results from the pilot’s lack of ability to properly use the guiding equipment on the plane.\textsuperscript{92} In \textit{Glorvigen v. Cirrus Design Corp.},\textsuperscript{93} a suit was brought against the manufacturers of an auto-pilot system for not giving the pilot proper training on how to use the technology which led to a crash.\textsuperscript{94} The court held that the manufacturer could not be liable for injuries due to a lack of training on the auto-pilot system because that type of

\textsuperscript{91} See \textit{id.} at 25 (summarizing the findings of a report which determined that technology was not to blame for the crash).

\textsuperscript{92} See generally \textit{Glorvigen v. Cirrus Design Corp.}, 796 N.W.2d 541 (Minn. Ct. App. 2011) (addressing a case where a crash resulted from a pilot’s lack of knowledge on how to properly use the auto-pilot system).

\textsuperscript{93} 796 N.W.2d 541 (Minn. Ct. App. 2011).

\textsuperscript{94} See \textit{Glorvigen} 796 N.W.2d at 543-48 (describing the plaintiff’s argument that manufacturers of the auto-pilot did not instruct the consumer on how to use it).
claim was unprecedented and it was up to the Supreme Court to extend existing law.  

Cases involving boating accidents where the auto-pilot system was in use have received similar treatment. In *Boucvalt v. Sea-Trac Offshore Servs.*, a wrongful death suit was brought against the manufacturer of an auto-pilot system for failing to test the equipment, failing to provide proper installation guidelines, and being aware about erratic behavior of the machine. The court held that even accepting this as true, it

---

95 See *id.* at 552, 557 (declining to extend case law which would require manufacturers to teach a consumer how to use an auto-pilot because the court felt that job was better suited for the Supreme Court).

96 See *Boucvalt v. Sea-Trac Offshore Servs.*, 943 So. 2d 1204 (La.App. 5 Cir. Oct. 17, 2006) (holding that a manufacturer was not liable for punitive damages for an accident that occurred while a boat was using auto-pilot).

97 943 So. 2d 1204 (La.App. 5 Cir. Oct. 17, 2006)

98 See *id.* at 1208 (listing the claims brought by the plaintiffs who allege that auto-pilot malfunction was the cause of injuries).
did not amount to gross negligence and punitive damages were not awarded to the plaintiff.\textsuperscript{99}

An incident where a ship known as the \textit{Crown Princess} breeched and injured more than three hundred passengers also involved the use of auto-pilot.\textsuperscript{100} While the auto-pilot was turned on, the boat turned sharply at a high rate of speed in shallow water and the second officer took the wheel and overcorrected causing the breech.\textsuperscript{101} The Board determined that the auto-pilot was not to blame and instead criticized the

\textsuperscript{99} \textit{See id.} at 1209 (determining that even if the assertions were true, the lack of gross negligence prevented plaintiffs from acquiring punitive damages).

\textsuperscript{100} \textit{See Waterman & Hensshon, supra} note 9, at 15 (informing that the \textit{Crown Princess} was the subject of a National Transportation Safety Board investigation after it crashed while using auto-pilot).

\textsuperscript{101} \textit{See Heeling Accident on M/V Crown Princess Atlantic Ocean Off Port Canaveral, Florida, National Transportation Safety Board}, (Jul. 18, 2006) located at http://www.ntsb.gov/doclib/reports/2008/MAR0801.pdf at vi (concluding that the high rate of speed in shallow water was to blame for the collision, making it human error, not a technology malfunction).
captain for turning the auto-pilot on too soon while in shallow waters, thus attributing it to human error.  

III. How the Available Standards can be Applied to the Autonomous Car.

This section discusses how the standards used for auto-pilot on planes and ships are applied to Google’s autonomous car including the FAA regulation of pilot-in-command. The technological differences between auto-pilot and the autonomous car are explained in relation to the applicability of auto-pilot cases. Next, the consumer expectations test is used and analyzed. Finally, the risk-utility test is utilized and the methods that would be used by each side in a lawsuit are explained.

In order to analyze the different standards, two possible hypothetical situations which could result in lawsuits will be examined. First, is a situation when the driver is alerted that the car may not be operating as well as it should, and the poor operation causes the accident. This could occur when poor weather inhibits the radar’s accuracy, alerting the driver that the car may not be capable of responding to the environment as quickly as usual. The second is a situation when the car gives

102 See id. at iv (assigning blame to the captain of the ship for not responding to the conditions appropriately by slowing down).
no warning to the driver and simply fails to operate as expected, causing an accident.

A. Applying Consumer Expectations: What to Expect When You’re Expecting a New Technology

In order to apply the consumer expectations test to an accident involving an autonomous vehicle, the vehicle would need to be dangerous to an extent beyond what the consumer could reasonably have expected when purchasing it.\textsuperscript{103} The first issue in using this test will be for a court to determine if the technology behind the car is too complicated for consumers to develop reasonable expectations.\textsuperscript{104} Consumers will likely argue that the complexity behind the car’s autonomy does not stop them from developing reasonable expectations about the safety and behavior of the product.\textsuperscript{105} For instance, the computer system on the car is capable of detecting when a pedestrian enters the

\textsuperscript{103} See Spendlove, supra note 60 at 1167 (describing the requirement for the application of a consumer expectations test).

\textsuperscript{104} See Garza, supra note 5, at 601-02 (postulating that courts may hesitate to apply a consumer expectations test when the technology is too complex).

\textsuperscript{105} See id. 601 (mentioning that consumers may be able to apply the test even if the technology is complex in nature).
street and can automatically stop the car to avoid hitting the pedestrian.\textsuperscript{106} Although the driver of the car may not understand the complex technology that stops the car, that lack of understanding would not prevent the driver from expecting that the car will stop itself when a pedestrian enters the street since the car does so every time this event occurs.\textsuperscript{107} However, the court may consider that the consumers have unrealistic expectations about how well the cars can maneuver and avoid accidents which may cause them to become over-reliant on the technology.\textsuperscript{108} A consumer who does not fully understand the technology may expect the car to work all of the time and may

\begin{flushleft}
\textsuperscript{106} See Guizzo, supra note 18 (commenting on the car’s ability to differentiate pedestrians from other objects which enables the car to avoid hitting people in the road).
\end{flushleft}

\begin{flushleft}
\textsuperscript{107} See Garza, supra note 5 at 601 (elaborating that consumers can become accustomed to the autonomous car driving itself without incident which could enable the use of the consumer expectations test despite the presence of a complex technology in the car).
\end{flushleft}

\begin{flushleft}
\textsuperscript{108} See id. 600 (expressing concern that the helpfulness of the technology could result in consumers expecting too much from the technology).
\end{flushleft}
not understand conditions that could cause a malfunction, such as very poor weather.109

Previous decisions about applying the consumer expectations test to seat belts, cruise control, and air bags can serve as a guideline for where courts may land on autonomous vehicles.110 Courts agree that seatbelts are something used frequently enough that consumers can develop reasonable expectations about how they should work and provide safety for the driver.111 However,

109 See Google Asks, supra note 26 (informing listeners that the technology on the car may not be completely accurate in very harsh weather conditions).

110 See Pruitt v. General Motors Corp., 86 Cal. Rptr. 2d 4th 1480 (Cal. Ct. App. 1999) (holding that the consumer expectations test could not be used for an air bag because it was not part of the everyday experience); Watson v. Ford Motor Co., 699 S.E.2d 169 (2010) (refusing to apply the consumer expectations test to cruise control since a lay juror could never understand the technology with explanation from an expert).

111 See Jackson v. GMC, 60 S.W.3d 800, 804 (Tenn. 2001) (contending that seat belts are not so complex as to prevent the use of the consumer expectations test and consumers typically know what to expect from seat belts since they are used almost every time the car is in use).
air bags and cruise control have not yet been accepted as commonplace enough to support the use of a consumer expectations test.\textsuperscript{112}

Even though most cars that consumers own are equipped with air bags, the court held that the consumer expectations test could not be used because the deployment of an air bag is not part of an everyday experience.\textsuperscript{113} Since the consumer would not be able to develop reasonable expectations for the deployment of the air bag, there could be no way to evaluate the typical expectation.\textsuperscript{114} In Watson v. Ford Motor Co., the court required the use of the risk-utility test over the consumer expectations test.

\textsuperscript{112} See Pruitt 86 Cal. Rptr. 2d 4th (distinguishing air bags from seat belts in the level of complexity); Watson 699 S.E.2d 169 (2010) (expressing hesitation about using the consumer expectations test on cruise control because of its complex nature).

\textsuperscript{113} See Pruitt 86 Cal. Rptr. 2d 4th at 1483-84 (reasoning that a reasonable expectation cannot be formed about a product which is not part of a consumer’s everyday experience).

\textsuperscript{114} See id. (determining that a jury could not form an accurate opinion about the design choices of an air bag without expert testimony about the positives and negatives of design choices).
test because of the complex nature of cruise-control.\textsuperscript{115} The court determined that testimony from expert witnesses who understood the technology was required to properly analyze if the cruise control was defective.\textsuperscript{116}

It is unclear how a court may analyze the technology of an autonomous car. The test can be applied to the seatbelt both because it is simple to understand and used frequently while the airbag and cruise control and both complex and infrequently used.\textsuperscript{117} The autonomous features on the car are far too complex for the average consumer to understand fully but are intended to be used daily.\textsuperscript{118} Consumers may be able to apply the test if

\textsuperscript{115} See \textit{Watson} 699 S.E.2d at 177 (explaining that the testimony of an expert witness was necessary to explain the complex technology to the jury).

\textsuperscript{116} See id. (analyzing whether the witness offered at trial was qualified as an expert).

\textsuperscript{117} See \textit{generally Pruitt} 86 Cal. Rptr. 2d 4th 1480 (basing its decision on the premise that the deployment of an airbag is not an everyday experience); \textit{Watson} (assuming that no lay juror could understand the technology that allows cruise control to operate).

\textsuperscript{118} See Thrun, \textit{supra} note 1 (describing the advanced technology on the cars and the hope that autonomous vehicles will
they can demonstrate that the daily use of the car will generate a working knowledge of how the car typically responds and what they can expect.\textsuperscript{119} However, even if the consumer uses the car frequently, a court may determine that they cannot possibly understand what made the car malfunction and know how to respond to it.\textsuperscript{120}

The court in \textit{Bresnahan v. Chrysler Corp.} would support the idea of using a consumer expectations test in this scenario.\textsuperscript{121} Consumer may not understand how the autonomous technology works, but if they come to understand how the car is expected to eventually be used for car sharing as well as to form highway trains).

\textsuperscript{119} \textit{See} Spendlove, \textit{supra} note 60, at 1167 (explaining that courts will not use the consumer expectations test if a consumer cannot establish enough familiarity with the product to know what to expect from it).

\textsuperscript{120} \textit{See} Kane, \textit{supra} note 19 (listing the technological features of the car and the process by which the data is recorded and analyzed).

\textsuperscript{121} \textit{See generally} Bresnahan \textit{v.} Chrysler Corp., 32 Cal. App. 4th 1559 (1995) (holding that the consumer expectation test can apply to air bags as long as the consumer can develop an expectation about how they should work).
operate and know the minimum safety standards, the test may be applicable.\footnote{See id. 1568 (explaining that if consumers develop minimum safety expectations in a product the consumer expectations test may apply even if the technology is too complex for consumers to understand).} Under this theory, the consumer expectations test may well apply to the autonomous car once the car has been available for some time, since the safety features and accident avoidance are one of the main selling features of the car.\footnote{See Mui, supra note 4 (expecting that consumers will be drawn to the advanced safety features).}

The result of the consumer expectations test may vary depending on which of the two hypothetical scenarios occurs. In the situation where the car alerted the driver to a problem with the system, it would be unlikely that the driver could escape liability for the accident, or succeed in a claim against the manufacturer.\footnote{See Spendlove, supra note 60, at 1167 (laying out that to succeed under a consumer expectations theory, the plaintiff must be able to demonstrate that the car was more dangerous than he reasonably expected).} The alert would serve as a warning to the driver that he needs to be in control of the car and at that point he could no longer expect the vehicle to automatically
avoid any danger.\textsuperscript{125} If the car were to malfunction and cause an accident with no alert to the driver, he could argue that it was beyond his expectation for the car to behave this way.\textsuperscript{126} The plaintiff may be able to shift blame to the manufacturer since his expectation would be to receive an alert in case of any malfunction and the failure of the car to do so would be unexpectedly dangerous.\textsuperscript{127}

Since Google has high expectations of limiting ninety percent of all accidents, the company should be aware that consumers may have very high hopes for their cars and if the consumer

\textsuperscript{125} See Google Asks, supra note 26 (informing that the Google car may not operate at peak accuracy in bad weather and will alert the driver if this occurs).

\textsuperscript{126} See Garza, supra note 5 at 600-02 (describing the necessity of an outcome beyond what a consumer could reasonably have expected).

\textsuperscript{127} See Google Asks, supra note 26 (clarifying the expectation that the car will inform the driver if it cannot operated as well as it should).
expectations test is adopted, that may impact what consumers presume about the capability of their car.\textsuperscript{128}

**B. Risk-Utility Applied: Discussing the Benefits of Applying the Standard**

The risk-utility test requires the plaintiff to demonstrate that his injuries were a proximate cause of the product design and that the injury could have been prevented by a reasonable design alternative.\textsuperscript{129} This could prove challenging initially because the cars are a new technology with few, if any, alternatives available.\textsuperscript{130} The only real alternative to the design, at least initially, is to buy a car which is not autonomous. Since Google is expecting the car to save thousands

\textsuperscript{128} See Mui, supra note 4 (indicating that Google has high expectations for the effects of the autonomous car, especially in terms of safety).

\textsuperscript{129} See Spendlove, supra note 60, at 1168 (explaining that courts have adopted the approach taken in the Restatements by comparing the benefits of a design with the potential for it to be unsafe).

\textsuperscript{130} See Garza, supra note 5 at 604 (discussing how the features of autonomous cars should be compared with other autonomous cars, not standard cars when determining what design alternatives there are).
of lives each year, it would be challenging to argue that the reasonable alternative would be safer.\textsuperscript{131}

To prove their case, manufacturers would need to include statistics about how the technology has saved lives and prevented injuries which could lead the trier of fact to determine that occasional accidents stemming from the unpredictability of autonomous cars is worth the number of lives saved.\textsuperscript{132} Seven factors are typically considered when determining if the benefits outweigh the risks including:

1. The usefulness and desirability of the product,
2. The safety aspects of the product,
3. The availability of a substitute product which would meet the same need and not be as unsafe,

\textsuperscript{131} See Mui, supra note 4 (analyzing the likelihood that Google will be able to meet its objective of preventing ninety percent of all traffic accidents while promoting safety as the primary motivator).

\textsuperscript{132} See Norton, supra note 17, at 687-88 (illustrating that manufacturers would need to provide evidence of the products social utility by discussing the lifesaving qualities in general).
(4) The manufacturer’s ability to eliminate the unsafe character of the product without impairing its usefulness or making it too expensive,

(5) The user’s ability to avoid danger by the exercise of care in the use of the product,

(6) The user’s anticipated awareness of the dangers inherent in the product and their avoidability, and

(7) The feasibility of spreading the loss by setting the price of the product or carrying liability insurance.\(^\text{133}\)

Since the car is still being tested, it is hard to say on which side of the balancing test the features may end up; however, Google is designing the car with safety as a primary focus, there are currently no safer alternatives, and the expected benefits to consumers are high since consumers will be able to spend less money.\(^\text{134}\) Highlighting the safety of the car

\(^{133}\) See id. at 677 (listing seven suggested factors that courts should consider when applying the risk-utility test).

\(^{134}\) See Thrun, supra note 1 (expressing a desire to keep safety as the primary focus with the expectation that up to half of the annual deaths from traffic accidents being prevented); Mui, supra note 4 (revealing all the expected benefits from the autonomous car including the large amount of money consumers could expect to save on gas and accident costs).
may make it easy for the consumer to be unaware of some of the dangers associated with the product and may cause consumers to feel that they do not need to monitor the car and exercise care while it is being used.\textsuperscript{135} Since the car is still being tested, consumer desirability is unknown, but if the car follows through on promises of better energy emissions, safer travel, and quicker commutes, it is not hard to imagine a high desirability.\textsuperscript{136} This makes it likely that the injured plaintiff would need to point out a specific design flaw which makes the car more unsafe.\textsuperscript{137}

Even if the plaintiff cannot demonstrate that the autonomous car has a more dangerous design than the typical car, he may still be able to receive damages if he can demonstrate

\textsuperscript{135} See Thrun, supra note 1 (expressing that safety is the primary motivation for the car’s creation).

\textsuperscript{136} See id. (expecting the car to improve quality of life for the driver).

\textsuperscript{137} See Garza, supra note 5 at 603 (reasoning that for a risk-utility claim to be successful, a consumer would have to demonstrate a specific improvement that could reasonably be implemented to avoid injury and demonstrate that the manufacturers chose not to implement it into the design of the product).
that the design of the autonomous car was more dangerous than other autonomous car designs.\textsuperscript{138} This can be done by demonstrating that a design choice made by Google could reasonably be altered to make the car safer without limiting the effectiveness of the car.\textsuperscript{139} For instance, Audi began introducing “autonomous technology” into their cars slowly to gradually increase the amount of actions the car is capable to do on its own.\textsuperscript{140} They use a laser scanner which is compact and

\begin{flushleft}
\textsuperscript{138} See id. at 604 (expressing concern that comparing the design of an autonomous car to a standard car may be misleading and courts should consider only comparing the design of one autonomous car to another when looking for reasonable alternative designs).
\end{flushleft}

\begin{flushleft}
\textsuperscript{139} See Norton, supra note 17, at 677-78 (illustrating that a machine designed without a safety guard would likely result in liability because of the increased risks unless a good reason for not including the guard was offered).
\end{flushleft}

\begin{flushleft}
\textsuperscript{140} See Tom Simonite, Audi Shrinks the Autonomous Car, \textit{TechnologyReview} (Jan. 8, 2013), http://www.technologyreview.com/news/509676/audi-shrinks-the-autonomous-car/ (discussing how Audi has been expanding autonomous features available in their cars over a period of time).
\end{flushleft}
designed to fit into the grill of a car, instead of the large laser the Google car uses that is placed on the top of the car.\textsuperscript{141} If the smaller laser was shown to be safer and effective for controlling the movements of the car, a plaintiff injured from a laser malfunction in the Google car may be able to win under a risk-utility theory.\textsuperscript{142}

If the driver of the car were alerted to a potential malfunction, he would likely not be able to prove that the malfunction was a proximate cause of his injuries as is required for a risk-utility test.\textsuperscript{143} The defendant would be able to argue that the driver was given notice that the car was unable to operate effectively and he should have taken over to avoid any

\textsuperscript{141} See id. (describing how Audi managed to compact the laser used although it does not perform as many functions as the Google laser).

\textsuperscript{142} See Norton, supra note 17, at 677 (detailing the ways in which a consumer can prevail on a risk-utility theory by pointing to specific design elements which could be reasonably be improved).

\textsuperscript{143} See Spendlove, supra note 60, at 1168 (explaining the necessary elements which must be met to bring a claim under risk-utility including that the injury was a proximate cause of the design flaw).
accident.\textsuperscript{144} Alternatively, since the risk-utility result is dependent on the plaintiff’s ability to point to a specific defect, the lack of a warning can only strengthen the plaintiff’s case.\textsuperscript{145}

A concern some have is that due to the complexity of the autonomous system, a strict liability system may be used in the event of an accident.\textsuperscript{146} If the car prevents accidents as well as expected, it will mean less lawsuits but also a likely

\textsuperscript{144} See Google Asks, supra note 26 (asserting that when the car alerts the driver to a situation where its effectiveness is limited, the driver needs to take control of the car and drive without technological assistance).

\textsuperscript{145} See Norton, supra note 17 at 677 (indicating that a plaintiff’s case requires a specific design flaw to be the cause of the injury).

\textsuperscript{146} See Megan McArdle, Are Autonomous Cars Really in Our Near Future?, The Daily Beast, (Jan. 24, 2013), http://www.thedailybeast.com/articles/2013/01/24/are-autonomous-cars-really-in-our-near-future.html (expressing concern that if courts elect to apply strict liability, manufacturers may not be willing to produce autonomous cars).
increase in the damages awarded in the litigation.\textsuperscript{147} If every victim is able to target the manufacturer instead of the driver, it could deter manufacturers from wanting to take the risk of producing an autonomous car.\textsuperscript{148} One way to combat this trend, if it indeed occurred, would be to require drivers to sit attentively at the wheel, much like the application of aviation standards would require.\textsuperscript{149}

\textsuperscript{147} See \textit{id.} (predicting that the autonomous car will lead to less accidents and therefore less litigation but the use of a strict liability standard would make all plaintiffs go after the manufacturers for much larger amounts of money).

\textsuperscript{148} See \textit{id.} (explaining that manufacturers would be concerned about liability when consumers could modify the cars and cause injuries if strict liability is imposed).

\textsuperscript{149} See \textit{id.} (considering the effect of imposing requirements on drivers to be responsible for all actions the car takes, even if the car is equipped with autonomous technology).
C. For the Autonomous Car does Aviation Law Fly or Can Naval Standard Anchor the Analysis?

FAA regulations regarding the pilot-in-command would be easy to apply to an autonomous car.\textsuperscript{150} These regulations would mandate that the driver of the car assume responsibility for the car and any actions taken in it.\textsuperscript{151} Applying the holding in Belger to an autonomous vehicle would result in the driver of the vehicle being liable for an accident that resulted from a system malfunction of which he should have been aware.\textsuperscript{152} The pilot should have known the auto pilot system did not engage appropriately and should have taken over the plane to get it on course.\textsuperscript{153} Similarly, if the car alerts the driver to a problem

\textsuperscript{150} See U.S. FAA FAR §91.3 (requiring the pilot to be in command of the aircraft at all times).

\textsuperscript{151} See id. (declaring that the pilot is responsible for all decision making and may have to answer for any actions he takes).

\textsuperscript{152} See Belger v. Moore, NTSB Order EA-4992, Docket SE-16318, 9 (N.T.S.B. Aug. 27, 2002) (finding the pilot responsible despite the technology not working as it should because the pilot is responsible for any action the aircraft takes).

\textsuperscript{153} See id. (declaring that the blame cannot be shifted from pilot to technology).
with the system, the driver would need to take control of the car and avoid any potential dangers. In this scenario, the autonomous aspect of the car is viewed as serving as an aid to the driver but the driver is expected to be in command at all times.

Even if the driver had no warning of the car’s inability to operate as expected, he would likely still be liable for any accident if the standards of aviation and naval law were applied because even though an accident was caused by a manufacturer defect, the driver would be expected to be in control of the car. The driver may attempt to shift blame to the manufacturer but a similar result as was seen in Boucvalt could

154 See id. (suggesting that as long as the person in control of the plane had the opportunity to manually correct the course, he was required to do so).

155 See id. (describing the auto-pilot as a technological aid but not a device that can be relied upon to perform the pilot’s function for him).

156 See id. (ruling that it did not matter that the technology malfunctioned since the pilot should have still been able to successfully control the plane).
occur. This would mean all of the liability would stay with the driver, even if the system malfunctioned without warning. One issue that may need to be discussed when using aviation law is the amount of training that takes place. A commercial pilot is required to complete a minimum of 250 hours of flight time with many airlines requiring 1,000 to 2,000 hours. Even

---

157 See Boucvalt v. Sea-Trac Offshore Servs., 943 So. 2d 1204, 1209 (La.App. 5 Cir. Oct. 17, 2006) (determining there was no gross negligence on the part of the manufacturers even when they did not properly test their auto-pilot before sale).

158 See id. (asserting that even if there was no warning to the operator that the technology was not working, that did not allow the plaintiff to collect punitive damages against the manufacturer).

159 See generally Glorvigen v. Cirrus Design Corp., 796 N.W.2d 541 (Minn. Ct. App. 2011) (discussing the effects of mandating that a manufacturer provide training to a pilot when selling an auto-pilot system but ultimately declining to extend the requirements).

160 See How Do I Get a Commercial Pilot License (Certificate)? Federal Aviation Administration, (May 27, 2009), http://faa.custhelp.com/app/answers/detail/a_id/87 [hereinafter Pilot License] (listing the requirements of obtaining a
with all of the training, the FAA has reported that 178 accidents from 1988 to 2009 were caused by inadequate training, incomplete operating manuals, inadequate training standards and operating procedures.\textsuperscript{161}

Applying Glorvigen, the manufacturers do not need to train the pilot in the specific equipment to avoid liability since the pilot’s initial training should be enough.\textsuperscript{162} Although the Department of Motor Vehicles in the states which allow autonomous cars may create additional training requirements, acquiring a driver’s license typically only requires passing an commercial pilot’s license including the number of hours of flight time).

\textsuperscript{161} Mike Ahlers, FAA Proposes Major Revamp of Airline Pilot Training, CNN (May 12, 2011), http://www.cnn.com/2011/TRAVEL/05/11/faa.pilot.training/index.html (describing the incidents which have led to the FAA electing to change their requirements for airline pilots).

\textsuperscript{162} See Glorvigen 796 N.W.2d at 557 (deciding that a manufacturer need not provide additional training in their specific product since pilots are trained in use of equipment as part of basic training).
eye test, written test, and road test. The lack of overall training for drivers compared with pilots could lead the courts to reconsider the Glorvigen holding, requiring specific training on the autonomous system.

The auto-pilot system used on planes does have some important differences from the autonomous components of the Google car. In both planes and ships, autopilot is typically only used for the middle part of the trip and is used to keep the plane on track, not adapt to a changing environment. The auto-pilot is

163 See Obtain a Driver’s License, Department of Motor Vehicles, http://dmv.dc.gov/node/178192 (last visited Feb. 24, 2013)(listing the requirements for obtaining a valid driver’s license in the District of Columbia as only needing to pass three tests).

164 See Glorvigen 796 N.W.2d at 557 (arriving at the conclusion in part because a pilot receives many hours of training before being able to operate a plane).

165 See Waterman & Hensshon, supra note 9, at 15 (noting that autonomous vehicles are designed with a different intent in mind than auto-pilot for a plane or boat is since the technology is required to be more advanced).

166 See id. (contrasting the limitations of auto-pilot with those of autonomous technology because auto-pilot is designed to keep
also designed to be consistently monitored by humans to ensure it is operating properly.\textsuperscript{167} It is likely that aviation standards are not something Google designers had in mind when they first created the autonomous car.\textsuperscript{168} The car does not simply stay on course but makes decisions and is expected to be fully engaged from the start of the trip until the end.\textsuperscript{169} Whatever the intent may be, if pilot in command becomes driver-

\underline{a vehicle going straight while autonomous technology is capable of interpreting objects in the environment and reacting to them}).

\textsuperscript{167} See id. (explaining that constant human oversight is both implied and expected with auto-pilot but may not be necessary while operating an autonomous car).

\textsuperscript{168} See Thrun, supra note 1 (intending the autonomous car to be part of a car share process which can decrease the size of highways and following distance and subsequently save consumers money and time during the commute).

\textsuperscript{169} See Kane, supra note 19 (referencing the technology which allows the car to drive without any human input during the course of the trip).
in-command, drivers will find themselves liable for any actions the car takes, and may need to monitor the drive.\textsuperscript{170}

The standards discussed can clearly be utilized by lawmakers and courts to help determine where liability will fall in case of an accident. However, it is the flexibility of the risk-utility test which makes it the best choice of current options to apply to the autonomous car.

\textbf{IV: Courts and Lawmakers Should Consider the Purpose of an Autonomous Car and the Impact on Society When Deciding Which Standard to Apply}

This section discusses the social and economic impact that the autonomous car could have in the long-term. Then the standards are compared by analyzing the effect to the driver, the manufacturer, and society as a whole. Finally, the section concludes by recommending that courts and lawmakers consider using the risk-utility test as the standard for liability because of the strict impact on drivers the aviation standards

\textsuperscript{170} See Strochlic, supra note 7 (offering the idea of driver-in-command as a method of easily assigning liability if the autonomous car gets into a crash by holding the driver accountable for any actions the car takes while he is behind the wheel).
would impose as well as the challenge of applying a consumer expectations test to such a complex technology.

**A. In a Perfect World: Potential Societal Impacts of a World Filled with Autonomous Cars and How Each Standard of Liability has an Impact**

The standard that courts or lawmakers adopt in assigning liability does not only affect how Google conducts business, it has potential to influence the profit or loss of trillions of dollars. If the autonomous car becomes the main method of automobile transportation, auto insurers and the $200 billion in premiums they collect annually could be affected by the sharp decline in accidents. Using a consumer expectations or risk-utility test may shift the focus from the driver’s actions to


(predicting that the benefits from the autonomous car could have major economic impacts).

\[172 \text{ See id. (suggesting that insurance companies may be one business which could see a huge reduction in profits if the autonomous car truly is successful in preventing the number of accidents predicted).} \]
the manufacturers, potentially causing drivers to not need insurance.173 Alternatively, the use of aviation standards would ensure the driver of the car is responsible for all actions and may necessitate the continuance of insured drivers.174

The government could potentially benefit from the switch to autonomous vehicles by saving money from not having to pay police officers, set up traffic lights, or arrest drunk drivers.175 This would not be likely if the aviation standard was used since the driver-in-command would necessitate traffic lights for the driver to interpret in case they take over the car, and driving drunk would limit the driver’s ability to be in

173 See id. (explaining that consumers may not decide to pay for insurance when the risk of injury from automobile accident is so low).

174 See Belger v. Moore, NTSB Order EA-4992, Docket SE-16318 (N.T.S.B. Aug. 27, 2002) (declaring that the pilot must be held accountable for all actions of the aircraft).

175 See Mui, supra note 171 (extrapolating the effects of the autonomous car to consider that expenses currently being used to deal with problems which arise from human drivers may not be needed in the future).
command. This type of government cutback may be possible under a consumer expectations test if the consumer’s expectation was to never need to take over control of the car. However, creating a situation where the consumer would never need to take control of the car would effectively create a strict liability standard where any time a car malfunctioned, even if the driver had warning of the error, the manufacturers would face liability because the reasonable expectation of the consumer is to never need to control the car. The risk-utility test focuses entirely on the design that was used and whether that design could have been safer without sacrificing the utility of the

---

176 See Strochlic, supra note 7 (describing that the driver-in-command principle would necessitate ways for the driver to be able to operate the vehicle).

177 See Garza, supra note 5, at 601 (expressing that the consumer expectations test applies only when consumers are familiar enough with a product to develop expectations).

178 See id. at 601-02 (explaining that if a car were to explode at a stop light, something no consumer would expect it to do, the manufacturers could easily be held liable).
product. In this way, the risk-utility standard would allow for the driver to let the car do the work since Google seems intent on designing a car that rarely needs human interference.

B. The Risk-Utility Standard is the Most Suitable for the Intent Behind the Autonomous Car

Based upon Google’s statements on their autonomous car, it is clear that they are hoping to reduce accidents and save costs. At the same time, the idea is also to give the driver more time during a commute while letting the car do all the heavy lifting. The spirit behind a car that drives itself is

179 See Spendlove, supra note 60 at 1167 (describing the balancing test the courts use for risk-utility where the benefit of the feature is compared with the risk to safety).

180 See Claburn, supra note 11 (remarking that the last 50,000 miles of testing were performed without any human taking control of the Google car).

181 See Thrun, supra note 1 (expressing the desire to make safety and consumer costs top priorities).

182 See id. (informing readers that the average commute time in the country is fifty-two minutes which the autonomous car can help cut down on, giving drivers more time for other activities).
to allow the driver a literal hands off trip and to allow the lasers, cameras, and GPS to navigate safely and efficiently.\footnote{See Kane, supra note 19 (mentioning the technology that the Google car utilizes to enable the car to drive itself and even signal intent to other drivers and pedestrians, allowing the driver to avoid having to take control of the car).}

Applying aviation and naval standards, or the driver-in-command idea, would place the responsibility solely in the lap of the driver.\footnote{See Strochlic, supra note 7 (predicting that the use of FAA regulations as a guideline to the autonomous car would free the manufacturers from much of the liability and hold drivers accountable for any action their car takes while they are behind the wheel).} This method is easy both for the driver to understand and for the courts to apply since liability would be assigned the same as it would if the car was not autonomous.\footnote{See id. (justifying the driver-in-command principle because the liability would be easy to assign because the driver would be held to the same standard of car as he would if the car was not capable of navigating without human interference).}

However, the differences between auto-pilot technology and an autonomous vehicle, both in the way the technology works and how
often it is used, is important to note.\textsuperscript{186} Also, the amount of training a pilot receives on how to recognize when the technology is working is drastically different than what the driver will receive.\textsuperscript{187} Although some companies working on autonomous technology may be in support of aviation standards, they are not ideal.\textsuperscript{188}

The consumer expectations test would not be able to be used right away because the technology would be too new for a consumer to develop an expectation.\textsuperscript{189} Even after the technology

\textsuperscript{186} See Waterman & Hensshon, supra note 9, at 15 (noting that the difference between autonomous technology and aviation auto-pilot may allow for aviation regulations to serve as a guideline but likely not a permanent template).

\textsuperscript{187} Compare Pilot License, supra note 160 (responding that a commercial pilot license takes a minimum of 1,000 hours of flight time to achieve); with Obtain a Driver’s License, supra note 163 (requiring only passing three tests to acquire a driver’s license).

\textsuperscript{188} See Simonite, supra note 140 (describing Audi’s statements that even while using autonomous technology, the driver should always remain in control of the car at all times).

\textsuperscript{189} See Garza, supra note 5 at 601 (discussing that a new technology may encounter problems with the application of a
becomes more commonplace, the courts may be hesitant to allow its use because the technology is very complex. Even if the test were able to overcome these hurdles, expectations of consumers may not be the best standard to utilize because consumers may have unrealistic expectations in new technology that is advertised as fully able to drive itself.

The risk-utility test is ideal because it ensures that the focus for courts is on the design of the car. Risk-utility balances the interests of the driver and the manufacturer by making sure the safest, reasonable design option is selected but also protects the manufacturer from liability when the utility to the average consumer is worth an accident to a minority of consumer expectations test while consumers are first learning what to expect of the product).

190 See id. (reinforcing that just because a technology is used frequently does not ensure a court will apply a consumer expectations test).

191 See Kane, supra note 19 (detailing the technology Google uses on the car which is designed to allow consumers a hands off trip while the car responds to a changing environment).

192 See Spendlove, supra note 60, at 1167 (remarking that the risk-utility test is a much preferred option to the consumer expectations test, which is often criticized).
consumers. If the risk-utility test were to be used, Google could know how to prepare for litigation by presenting the statistics about how safe the design of the car is and why particular design choices were made over alternatives.

V. Conclusion

With the autonomous car’s introduction to the market on the horizon, courts and lawmakers need to be prepared for how to determine liability in case of an autonomous car crash. The technology may be new, but courts do not need to create a new test in order to deal with the new problem. The driver-in-command, consumer expectations, and risk-utility tests are all capable of providing guidance towards the new autonomous technology.

\(^{193}\) See Spendlove, supra note 60, at 1167-68 (describing the balance that courts use to weigh the benefits of the design chosen by the manufacturers with the safety concerns the consumer may have).

\(^{194}\) See Garza, supra note 5 at 603 (describing the method typically used by manufacturers who face a risk-utility claim for a defective product which is to provide statistics about the safety benefits of their product and how it benefits the population at large).
The impacts on the economy and many existing business could be huge. An autonomous car could save the government millions of dollars in regulatory expenses, drastically decrease individual spending on accidents and parking, and create opportunities for new businesses. Some observers expect that the addition of such a car could be worth trillions of dollars. Currently, some states have already begun working on adopting regulations to deal with autonomous technology, but more states will need to get on board. Under current laws and regulations, the autonomous car may be driven in the United States but some alterations to vehicle codes will need to be made for it to truly be incorporated.

When choosing which standard to use, the social impacts of having a car that drives itself as well as the potential impact on the driver need to be considered. The risk-utility test’s ability to focus purely on the design choices the car has while balancing the needs of both the driver and manufacturer make the test the most ideal. Courts should consider adopting the risk-utility standard when faced with an accident although Sergey Brin, co-founder of Google, may believe that no standard is necessary. After all, when he was asked who would be liable for a ticket when a self-driving car runs a red light, he simply responded “[s]elf-driving cars do not run red lights.”