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## Defective Designs in Airbag Technology

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# DEFECTIVE DESIGNS IN AIRBAG TECHNOLOGY

BENJAMIN ASHLEY\*

I.	INTRODUCTION.....	49
II.	HISTORY OF AIRBAGS .....	50
III.	HOW AIRBAGS WORK .....	56
IV.	PROBLEMS WITH AIRBAGS.....	61
V.	RECALL OF DEFECTIVE AIRBAGS.....	62
VI.	LITIGATION INVOLVING AIRBAGS THAT FAIL TO DEPLOY.....	65
VII.	LITIGATION INVOLVING DELAYS IN AIRBAGS’ DEPLOYMENTS ....	68
VIII.	LITIGATION INVOLVING AIRBAGS THAT DEPLOY WHEN THEY SHOULD NOT DEPLOY AT ALL .....	69
IX.	LITIGATION INVOLVING AIRBAGS THAT DEPLOY TOO FORCEFULLY .....	71
X.	LITIGATION INVOLVING MANUFACTURER’S FAILURE TO PROVIDE WARNINGS .....	73
XI.	SOLUTIONS TO REDUCE AIRBAG INJURIES .....	75
XII.	REFORMS NEEDED TO IMPROVE AIRBAG SAFETY .....	76
XIII.	LEGISLATION TO MAKE AIRBAGS SAFER .....	78
XIV.	SOLUTIONS FOR PROBLEMS RAISED BY AIRBAGS .....	79
XV.	CONCLUSION.....	80

## I. INTRODUCTION

Airbags have been a major concern for automobile manufacturers and federal regulators. As of January 1, 2009, the National Highway Traffic Safety Administration (“NHTSA”) attributed “296 deaths to front airbags, including 191 children, 92 drivers, and 13 adult passengers . . . .”<sup>1</sup> Airbag systems are designed to reduce injuries in motor vehicle crashes and especially in crashes at high speeds.<sup>2</sup> However, airbags have deployed incorrectly or malfunctioned due to a defect in their designs,<sup>3</sup> and their incorrect deployment or malfunction has caused serious injuries and even death for vehicle occupants.<sup>4</sup>

Although the technology to employ airbags was available by the mid-1970s, automobile manufacturers were hesitant to use airbags until the

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<sup>1</sup> Ins. Inst. for Highway Safety, *Belted Drivers Appear Less Protected Under New Front Airbag Standards*, 45 STATUS REPORT, No.1, (2010), at 1.

<sup>2</sup> John Uustal, *Airbag Defects*, THE PRODUCT SAFETY PROJECT, <http://www.productsafetyproject.com/air-bag-defects/>.

<sup>3</sup> Robert Dan Spendlove, *Casenote and Comment: 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, 1157 (2006).

<sup>4</sup> *Id.* at 1158.

federal government mandated that the manufacturers install front airbags.<sup>5</sup> However, when the manufacturers did install the airbags, they used “cheap and unsafe designs” even though they knew that safer designs were available.<sup>6</sup> Many children and small adults were injured or killed by the airbags that were installed before 1996.<sup>7</sup> Therefore, in 1998, the National Highway Traffic Safety Administration, which was established to enforce automobile safety, issued a rule that required manufacturers to redesign airbags and upgrade testing requirements to reduce the risk of airbag-related injuries.<sup>8</sup>

Although the federal agency has issued regulations to improve airbags, “auto manufacturers continue to cut corners to save costs.”<sup>9</sup> The manufacturers have even delayed recalling vehicles when they knew that the vehicles’ airbags had injured or killed the drivers or passengers.<sup>10</sup> The NHTSA has tried to regulate the auto industry, but due to a lack of resources, the agency has sometimes been lax in following up on claims related to vehicle defects.<sup>11</sup> Because airbags continue to injure the vehicle occupants, the federal government needs to pass stricter regulations and laws to protect the public from the risks that are posed by defective airbags.<sup>12</sup>

## II. HISTORY OF AIRBAGS

“In 1953, the United States Patent and Trademark Office issued the first airbag patent to John W. Hetrick,” a retired industrial engineer.<sup>13</sup> Hetrick “conceived of the device following an accident on a Sunday afternoon drive with his family.”<sup>14</sup> Just after Hetrick drove up a hill, “he threw on the brakes and veered into a ditch” to avoid hitting a large boulder

<sup>5</sup> LAWRENCE R. BOOTH & ROGER E. BOOTH, *Airbag Cases Take Center Stage Once Again - Killer Airbags*, BOOTH & KOSKOFF (2014), <http://www.boothkoskoff.com/airbag-cases-take-center-stage-once-again/>.

<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> John D. Graham, *Technological Danger Without Stigma: The Case of Automobile Airbags*, in *RISK, MEDIA, AND STIGMA: UNDERSTANDING PUBLIC CHALLENGES TO MODERN SCIENCE AND TECHNOLOGY* 241, 241 (James Flynn et al. eds., 2001).

<sup>9</sup> Lawrence Baron, *The ‘Smart’ Airbag Case: Airbags Are Intended to Save Lives, But They May Also Cause Injury. As Airbag Technology Has Become More Complex, So Has Airbag Litigation*, TRIAL, Feb. 2007, at 40.

<sup>10</sup> Hiroko Tabuchi, *Airbag Flaw, Long Known to Honda and Takata, Led to Recalls*, N.Y. TIMES, Sept. 12, 2014, at A1.

<sup>11</sup> Hilary Stout, Danielle Ivory, & Rebecca R. Ruiz, *Regulator Slow to Respond to Deadly Vehicle Defects*, N.Y. TIMES, Sept. 15, 2014, at A1.

<sup>12</sup> *Highway Safety Agency Is Falling Short in Its Mission to Protect the Public*, THE BUFFALO NEWS.COM, Sept. 17, 2014, <http://www.buffalonews.com/apps/pbcs.dll/article>.

<sup>13</sup> Spendlove, *supra* note 3, at 1144.

<sup>14</sup> *Id.*

in the road.<sup>15</sup> He threw his arms in front of his daughter to prevent her from hitting the dashboard.<sup>16</sup> After the accident, Hetrick decided to invent a way to shield passengers from a car's sudden stop.<sup>17</sup> He "developed a safety cushion for cars, the forerunner of today's airbags",<sup>18</sup> but the device was unusable at the time because the sensor was not refined enough to detect a collision.<sup>19</sup>

The idea of airbags languished until the late 1960's, when Ford and General Motors began to research and test airbag systems in automobiles.<sup>20</sup> After unsuccessful results in developing the airbag, the automobile makers decided not to move forward with the airbag systems because of "the cost of adding airbags, customers' disinterest, and potential liabilities that they faced if the airbags failed."<sup>21</sup> However, the United States government became more involved in car safety issues, and in 1966, Congress enacted the National Traffic and Motor Vehicle Safety Act to establish and enforce new safety standards for motor vehicles and road traffic safety.<sup>22</sup> In 1967, the National Highway Traffic Safety Administration issued Federal Motor Vehicle Safety Standard 208 to address the protection of motorists involved in accidents.<sup>23</sup> The original standard only required that manual seatbelts be installed in all passenger cars.<sup>24</sup>

In 1970, the NHTSA amended Standard 208 to require that either airbags or automatic seatbelts be installed in the 1974 model year passenger cars.<sup>25</sup> Although the car manufacturers opposed the amended standard, "Ford did build an experimental fleet of cars equipped with airbags and decided to introduce airbags into its 1971 line of full-size Lincolns and Mercurys."<sup>26</sup> However, Ford's chief body engineer nixed the idea of using airbags because poor performance issues still persisted, "tests on child-size dummies showed injuries were likely, and windshields often broke when the airbags were activated."<sup>27</sup>

Henry Ford II, the chairman of Ford, and Lee Iacocca, Ford's president, met with President Nixon to discuss their concerns that "the new safety regulations would put the United States at a competitive

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<sup>15</sup> Second Chance Garage, LLC, *Cushioning the Blow: History of Automotive Airbags* (2014), <http://www.secondchancegarage.com/public/history-of-airbags.cfm>.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> Spendlove, *supra* note 3, at 1145.

<sup>20</sup> *Id.*

<sup>21</sup> Second Chance, *supra* note 15.

<sup>22</sup> National Traffic and Motor Vehicle Safety Act of 1966, 15 U.S.C. §§ 1381-1431 (1970), as amended, 15 U.S.C. §§ 1391 et seq.

<sup>23</sup> *Id.*

<sup>24</sup> *Id.*

<sup>25</sup> CHING-YAO CHAN, FUNDAMENTALS OF CRASH SENSING IN AUTOMOTIVE AIR BAG SYSTEMS 3 (2000).

<sup>26</sup> Second Chance, *supra* note 15.

<sup>27</sup> *Id.*

disadvantage in competing with Japanese car makers and would harm the U.S. economy.”<sup>28</sup> Ford’s leaders claimed that they had spent \$240 million in safety research and had concluded that the airbag was “a complete waste of money.”<sup>29</sup> Ford and other car manufacturers continued to oppose the use of airbags, and Chrysler Corporation sued to challenge the amended standard.<sup>30</sup> The Court of Appeals in *Chrysler Corp. v. Department of Transportation* found substantial evidence to support the amended standard,<sup>31</sup> but the Nixon Administration decided to delay the mandate for two years because of continued pressure from automobile manufacturers.<sup>32</sup>

Faced with a deadline to install airbags or automatic seatbelts by 1976, car manufacturers began to develop and revise their airbags. In 1973, General Motors installed and tested the airbags in one thousand Chevrolet Impalas, and in 1974, General Motors began offering customers an airbag option in Cadillacs, Oldsmobiles, and Buicks.<sup>33</sup> The president of General Motors “wanted to test airbags in 150,000 cars but when the 1973 oil crisis came along and pumped gas prices sky high,” consumers did not want to pay more for safety features.<sup>34</sup> After three years, General Motors only sold 10,321 cars that were equipped with airbags, so the company dropped the airbag option.<sup>35</sup>

Because of the public resistance to airbags, William Coleman, the Secretary of Transportation under the Ford Administration, indefinitely extended the mandate that required car manufacturers to install either airbags or automatic seatbelts.<sup>36</sup> Coleman “proposed a test program to include airbags in 400,000 cars.”<sup>37</sup> However, Brock Adams, Coleman’s successor as the Secretary of Transportation, “decided that the demonstration project was unnecessary” and that car manufacturing should continue without this program.<sup>38</sup> Adams issued a new mandate, known as Modified Standard 208, which required automakers to install either airbags or detachable automatic seatbelts “beginning with large cars in model year 1982 and extending to all cars by model year 1984.”<sup>39</sup>

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<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> *Chrysler Corp. v. Dep’t of Transp.*, 472 F.2d 659-663 (6th Cir. 1972).

<sup>31</sup> *Id.*

<sup>32</sup> Second Chance, *supra* note 15.

<sup>33</sup> Spendlove, *supra* note 3, at 1145.

<sup>34</sup> Second Chance, *supra* note 15.

<sup>35</sup> Spendlove, *supra* note 3, at 1145.

<sup>36</sup> Margot F. Reagan, *Judicial Review of an Administrative Agency Rescission: Motor Vehicle Manufacturers Ass’n v. State Farm Mutual Automobile Insurance Co.*, 18 AKRON L. REV. 153, 155 (Summer 1984).

<sup>37</sup> Second Chance, *supra* note 15.

<sup>38</sup> Reagan, *supra* note 36, at 155.

<sup>39</sup> Spendlove, *supra* note 3, at 1145-46.

When President Reagan came into office in 1981, he kept his promise to “close down the Federal Auto Safety Programs.”<sup>40</sup> After only 8 days in office, Reagan issued “an Executive Order which postponed the effective date of all major agency regulations which were pending at the time.”<sup>41</sup> The NHTSA responded first “by extending the passive restraint requirements for more than one year,” and then, on October 29, 1981, by revoking Standard 208 altogether.<sup>42</sup> The NHTSA maintained that the cost of implementing the requirements under Standard 208 outweighed any possible safety benefits.<sup>43</sup> According to the agency, the majority of automakers “intended to use automatic seatbelts as opposed to airbags in ninety-nine percent of its new cars.”<sup>44</sup> The agency also believed “that so many car owners would detach the seatbelts that the devices would be virtually ineffective in reducing the number of deaths and injuries occurring as a result of automobile accidents.”<sup>45</sup> Therefore, in rescinding Standard 208 in October 1981, the agency concluded “that there was no longer any reason to believe that the passive restraint requirements would be effective as safety measures,”<sup>46</sup> and “that amending the Standard was not a reasonable alternative.”<sup>47</sup>

In *Motor Vehicle Ass’n v. State Farm Mutual Automobile Insurance Co.*, however, the United States Supreme Court ruled that “the rescission of the passive restraint requirement of Standard 208 was arbitrary and capricious.”<sup>48</sup> The Supreme Court stated that the National Highway Traffic Safety Administration “did not explain why, given that automatic seatbelts were not satisfactory, it did not simply require airbags in all vehicles.”<sup>49</sup> “The Supreme Court noted that, ‘For nearly a decade, the automobile industry waged the regulatory equivalent of war against the airbag and lost.’”<sup>50</sup> According to Justice White, “regulation ‘was necessary because the industry was not sufficiently responsive to safety concerns.’”<sup>51</sup> Therefore, the NHTSA’s attempted rescission of Standard 208 in October 1981 failed, “and the requirement for passive restraints stood.”<sup>52</sup>

Even after the Supreme Court ruling, the automakers continued to resist the adoption of airbags, and the National Highway Traffic Safety Administration delayed implementation of the airbag requirement several

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<sup>40</sup> Reagan, *supra* note 36, at 156.

<sup>41</sup> *Id.*

<sup>42</sup> *Id.*

<sup>43</sup> *Id.* at 158.

<sup>44</sup> *Id.*

<sup>45</sup> *Id.*

<sup>46</sup> *Id.* at 157.

<sup>47</sup> *Id.* at 158.

<sup>48</sup> *Motor Vehicle Ass’n v. State Farm Mut. Auto. Ins. Co.*, 103 S. Ct. 2856, 2868 (1983).

<sup>49</sup> Spendlove, *supra* note 3, at 1153.

<sup>50</sup> *Id.*

<sup>51</sup> *Id.*

<sup>52</sup> Second Chance, *supra* note 15.

times due to pressure from car manufacturers.<sup>53</sup> In 1984, Reagan's second Secretary of Transportation, Elizabeth Dole, managed to extend the deadline by giving manufacturers until 1986 to phase in the airbags or automatic seatbelts.<sup>54</sup> "Dole encourage[ed] the use of airbags by allowing driver-side bags to be used until 1994 without automatic protection for the front seat passenger."<sup>55</sup> However, in 1991, Congress passed the Intermodal Surface Transportation Efficiency Act, which required airbags to be installed on the driver's side and the passenger's side in all cars by the 1997 model year and in all light-duty trucks by the 1999 model year.<sup>56</sup>

The automobile manufacturers rushed to meet the deadlines to install airbags, but they did not test the airbags adequately and used less expensive, less protective designs.<sup>57</sup> The first-generation airbags that were installed were "designed to protect a 160-pound, 5-foot, 10-inch driver in a head-on crash."<sup>58</sup> However, "by 1996 the federal government acknowledged that airbags could kill women and children."<sup>59</sup> As a result, "[t]he government encouraged manufacturers [to design airbags] to protect vehicle occupants of all shapes and sizes and to conduct tests" to show what would happen "when occupants were out of position," such as when they were not wearing seatbelts, were sitting too closely to the dashboard, or when they were leaning up against the side window.<sup>60</sup> The resulting tests "confirmed the dangers to small-sized occupants."<sup>61</sup>

After a public outcry over airbag-related deaths of mostly women and children, the National Highway Traffic Safety Administration and the automakers made a "concerted effort to advise the public of dangers associated with airbags."<sup>62</sup> In 1996, the agency mandated that airbag warning signs be posted on the sun visors in the motor vehicles to advise drivers about the potential dangers of airbag deployment.<sup>63</sup> The agency also authorized car dealers and repair shops to disconnect airbags on a case-by-case basis with the agency's approval.<sup>64</sup>

Additionally, the NHTSA began to encourage automakers to develop "depowered" airbags that would deploy with less force.<sup>65</sup>

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<sup>53</sup> Spendlove, *supra* note 3, at 1147.

<sup>54</sup> Second Chance, *supra* note 15.

<sup>55</sup> CHAN, *supra* note 25, at 3.

<sup>56</sup> Intermodal Surface Transportation Efficiency Act, Pub. L. No. 102-240 (1991).

<sup>57</sup> Second Chance, *supra* note 15.

<sup>58</sup> SUSAN FERGUSON, MARIA SEGUI-GOMEZ, & JAMES SIMONS, *Airbags*, in RISK: A PRACTICAL GUIDE FOR DECIDING WHAT'S REALLY DANGEROUS IN THE WORLD AROUND YOU 34, 34 (David Ropeik & George Cray eds., 2002).

<sup>59</sup> Second Chance, *supra* note 15.

<sup>60</sup> *Id.*

<sup>61</sup> *Id.*

<sup>62</sup> Lawrence Baron, *The Hard Truth About Airbags*, TRIAL, Jan. 1, 2000, at 53.

<sup>63</sup> Second Chance, *supra* note 15.

<sup>64</sup> *Id.*

<sup>65</sup> Ins. Inst. for Highway Safety, *supra* note 1, at 2.

Originally, under Federal Motor Vehicle Safety Standard 208, “manufacturers had to certify that their vehicle met certain performance criteria when it was crashed into a solid barrier at speeds up to 30 [miles per hour], at right and left angles up to 30 degrees, and head-on.”<sup>66</sup> In these conditions, “belted and unbelted crash test dummies were not supposed to sustain certain injuries when their seats were positioned in the middle of the seat track.”<sup>67</sup>

Because of a rising number of airbag-related injuries, the National Highway Traffic Safety Administration temporarily amended Federal Motor Vehicle Safety Standard 208 in 1998.<sup>68</sup> The changes allowed manufacturers to implement “depowered” airbags that were less powerful.<sup>69</sup> Under the revised standard, manufacturers had the option of using “sled tests with unbelted dummies to certify that their vehicles met crash performance rules.”<sup>70</sup> In a sled test, a mock-up of the passenger compartment is mounted on a moving platform that simulates the sudden deceleration of a vehicle crash and “mimics the forces on occupants during crashes.”<sup>71</sup> The NHTSA prescribed lower maximum accelerations under the sled test than those typically used in crash tests so that the “airbags [did not] need to deploy as quickly or forcefully to catch and cushion unbelted dummies.”<sup>72</sup>

In 2001, however, the National Highway Traffic Safety Administration suspended the use of the sled option and reinstated rigid-barrier tests for unbelted occupants.<sup>73</sup> The agency “introduced a range of tests, including head-on and offset frontal crash tests... using different-size dummies.”<sup>74</sup> These tests led to the development of advanced front airbags, which were designed to be suppressed or to “deploy with less force when passengers are small or out of position.”<sup>75</sup> They can “detect children in the front seat and drivers who are sitting too close to the airbag.”<sup>76</sup> The airbags use a dual-level inflation system that deploys at different levels of force depending on the severity of a car crash.<sup>77</sup> In high-speed car crashes, the airbags deploy more aggressively than they do in low-speed crashes.<sup>78</sup> The

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<sup>66</sup> Baron, *The Hard Truth About Airbags*, *supra* note 62, at 55.

<sup>67</sup> *Id.*

<sup>68</sup> John E. Hinger & Harold E. Clyde, *Advanced Airbag Systems and Occupant Protection: Recent Modifications to FMVSS 208*, in AIRBAG TECHNOLOGY 2001, 19, 19 (Society of Automotive Engineers, 2001).

<sup>69</sup> *Id.* [Authority has a paywall – Ed.]

<sup>70</sup> Ins. Inst. for Highway Safety, *supra* note 1, at 1-2.

<sup>71</sup> *Id.* at 2.

<sup>72</sup> *Id.*

<sup>73</sup> *Id.*

<sup>74</sup> *Id.*

<sup>75</sup> *Id.*

<sup>76</sup> Baron, *The ‘Smart’ Airbag Case*, *supra* note 9, at 40.

<sup>77</sup> *Id.* at 43.

<sup>78</sup> *Id.*

NHTSA issued a certified advanced airbag rule, which was to be phased in beginning with 2003 model cars, and by 2006, all passenger cars and light-duty trucks had to be equipped with the advanced front airbags.<sup>79</sup>

While carmakers are now required to install front airbags, some automakers, such as Volvo, “began installing side airbags into their vehicles in the late 1990s”.<sup>80</sup> “But when [the] NHTSA first proposed a new side-impact crash standard in 2004, the industry filed a number of complaints.”<sup>81</sup> One of the industry’s major complaints about the new crash standard was the cost of compliance per vehicle.<sup>82</sup> In late 2007, despite opposition from some automakers, the NHTSA enacted Federal Motor Vehicle Safety Standard 214.<sup>83</sup> Standard 214 mandated that all automakers must phase in additional side-impact protection features for their cars, trucks, and SUVs.<sup>84</sup> The standard went into effect on September 1, 2009, and every automaker was required to comply within four years.<sup>85</sup> Standard 214 specified performance requirements for the protection of occupants in side-impact crashes, and the Standard required all carmakers to bolster the sides of their vehicles through stronger roof rails, door panels, and B-pillars that would absorb more energy.<sup>86</sup> Although Standard 214 did not specifically require the use of side airbags for side-impact protection, many new cars and SUVs currently offer either standard or optional side airbag protection.<sup>87</sup>

### III. HOW AIRBAGS WORK

Airbags are designed to reduce injuries by absorbing “some of the impact of a crash and act[ing] as a buffer between the vehicle occupant and the vehicle’s dashboard and windshield.”<sup>88</sup> “When properly designed, airbags can be useful safety devices. Unfortunately, many airbag systems are poorly designed.”<sup>89</sup> The poor designs have created defects in airbags that “have resulted in thousands of serious airbag injuries” and even death.<sup>90</sup>

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<sup>79</sup> Ins. Inst. for Highway Safety, *supra* note 1, at 2.

<sup>80</sup> Dale Buss, *New Side-Impact Requirements Will Change the Cars We Buy*, EDMUNDS.COM, <http://www.edmunds.com>.

<sup>81</sup> *Id.*

<sup>82</sup> *Id.*

<sup>83</sup> Fed. Motor Vehicle Safety Standards & Regulations, 49 C.F.R. § 571.214 (2007).

<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> *Id.*

<sup>87</sup> NHTSA, *Side-Impact Airbags*, [http://www.safercar.gov/Vehicle+Shoppers/Air+Bags/Side-Impact+Air+Bags+\(SABs\)](http://www.safercar.gov/Vehicle+Shoppers/Air+Bags/Side-Impact+Air+Bags+(SABs)).

<sup>88</sup> Ustal, *supra* note 2.

<sup>89</sup> *Id.*

<sup>90</sup> *Id.*

“The goal of an airbag is to slow the passenger’s forward motion as evenly as possible in a fraction of a second.”<sup>91</sup> In the control unit, an airbag assembly consists of the airbag, the inflation system, the crash sensors, the electrical connectors, the airbag retainer, and the airbag cover.<sup>92</sup> The airbag “itself is made of a thin, nylon fabric.”<sup>93</sup> “The driver’s side airbag [is] mounted in the center of the steering wheel,” and the passenger’s airbag is generally mounted “in the top of the dashboard on the passenger side of the vehicle.”<sup>94</sup> The size of the driver airbag is approximately sixteen gallons, and the size of the passenger airbag is approximately thirty-two gallons.<sup>95</sup> The airbag for the driver is considerably smaller than the other airbags due to the distance between the airbag and “the occupant and the physical space in which the airbag is housed.”<sup>96</sup>

Airbags have many electrical and mechanical sensors to detect car crashes.<sup>97</sup> A few car manufacturers use mechanical sensors that “work independent of the electrical system and respond similarly to the electrical sensors.”<sup>98</sup> Because “a mechanical sensor does not require a power source, it cannot be deactivated like an electrical sensor can when the battery is disconnected.”<sup>99</sup> “Some [manufacturers] use an electromechanical ‘ball and tube’ mechanism, which basically consists of a small tube containing a circuit switch and ball that’s held together by a magnet. If a collision occurs, the ball is dislodged from the magnet and rolls forward in the tube, hitting a switch that completes the electrical circuit.”<sup>100</sup> Other similar electrical designs use “a metal roller or spring loaded weight instead of a ball... to trip the sensor.”<sup>101</sup>

Newer cars contain an accelerometer, which is an electronic chip that measures acceleration or force.<sup>102</sup> When a collision occurs, the car begins to decelerate very rapidly, and the accelerometer detects a change of speed.<sup>103</sup> If the deceleration is great enough, the accelerometer triggers the

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<sup>91</sup> Marshall Brain, *How Airbags Work*, HOW STUFF WORKS, [auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/airbag.htm](http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/airbag.htm).

<sup>92</sup> Laura Smalley, *Automobile Airbag Malfunction Litigation: Practice and Strategy*, 83 AM. JUR. TRIALS 1 (2002).

<sup>93</sup> Zeeshan Ahmad, *The Unassuming Danger of Car Airbags: Injuries Secondary to Airbag Deployment*, 42 INJURY EXTRA 69, 69 (2011).

<sup>94</sup> Smalley, *supra* note 92.

<sup>95</sup> ULRICH SEIFFERT & LOTHAR WECH, *AUTOMOTIVE SAFETY HANDBOOK 206* (2nd ed. 2007)..

<sup>96</sup> Dan Newlin, *How Do Airbags Work?*, AIRBAG MALFUNCTIONS, <http://www.newinlaw.com/airbag-malfunctions-faqs/how-do-airbags-work/>.

<sup>97</sup> *How Does Your Car’s Airbag System Work*, CAR SAFETY, Nov. 13, 2013, <http://www.carsdirect.com/car-safety/how-does-your-cars-airbag-system-work>.

<sup>98</sup> *Id.*

<sup>99</sup> *Id.*

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

<sup>102</sup> *Id.*

<sup>103</sup> *Id.*

airbag's electrical circuit.<sup>104</sup> Crash sensors work with the control unit to "monitor the direction and severity of an impact" and to determine whether the airbag should be deployed.<sup>105</sup> A vehicle's rapid deceleration causes the electrical contacts to close, signals the control unit, and the control unit then checks for a signal from the rear sensor.<sup>106</sup> "The signal from the rear sensor must arrive at the [control unit] first for the airbag to deploy. In addition, two sensors must signal a crash before the airbag will deploy."<sup>107</sup> "The forward sensors are located in various locations forward of the passenger compartment," such as in the bumper or grille of the vehicle, and the rear sensors "are located in various portions of the passenger compartment."<sup>108</sup>

The crash "sensors are the brains of the airbag system," and "[t]hey detect the collision and tell the airbag whether, when, and how forcefully to fire."<sup>109</sup> However, because the sensors are activated by the rapid deceleration of the vehicle, "the sensors do not activate at the same rate at all speeds and in all crashes."<sup>110</sup> The sensors will normally deploy the airbags when a "collision force [is] equivalent to running into a brick wall at ten to fifteen miles per hour."<sup>111</sup> "Sudden braking, or [sic] driving on rough or uneven pavement, normally will not create enough deceleration to trigger the sensors" to deploy the airbags.<sup>112</sup> However, if the manufacturer sets the thresholds too low, the airbags will deploy during the normal operation of the vehicle or in relatively "minor collisions when they should not have deployed at all."<sup>113</sup> Sensors that are calibrated incorrectly can cause airbags to malfunction and to deploy incorrectly,<sup>114</sup> and defective sensors have resulted in serious and even fatal injuries to the vehicle occupants.<sup>115</sup>

For an airbag to deploy, the sensors will trigger the ignition to produce a gas that will fill the airbag.<sup>116</sup> The airbag's inflation system ignites solid pellets, which burn and "release nitrogen gas in large quantities."<sup>117</sup> These hot blasts of nitrogen inflate the airbag,<sup>118</sup> and the airbag then "bursts from its storage site at up to 200 miles per hour," which is faster than the blink of an eye.<sup>119</sup> The airbag is designed to cushion the

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<sup>104</sup> See generally *id.*

<sup>105</sup> Ahmad, *supra* note 93, at 69.

<sup>106</sup> Smalley, *supra* note 92.

<sup>107</sup> *Id.*

<sup>108</sup> *Id.*; Newlin, *supra* note 96.

<sup>109</sup> Baron, *The 'Smart' Airbag Case*, *supra* note 9, at 42.

<sup>110</sup> Newlin, *supra* note 96.

<sup>111</sup> Brain, *supra* note 91.

<sup>112</sup> Newlin, *supra* note 96.

<sup>113</sup> Baron, *The 'Smart' Airbag Case*, *supra* note 9, at 42-43.

<sup>114</sup> *Id.* at 43.

<sup>115</sup> *Id.*

<sup>116</sup> Brain, *supra* note 91.

<sup>117</sup> Smalley, *supra* note 92.

<sup>118</sup> *Id.*

<sup>119</sup> Brain, *supra* note 91.

occupants so as to prevent or reduce the impact with the steering wheel or dashboard.<sup>120</sup> Therefore, the airbag inflates rapidly so that it is “fully inflated by the time a person’s body begins to move in reaction to a collision.”<sup>121</sup>

Advanced airbags have a dual-level inflator that regulates the force with which the airbag is deployed, depending on the severity of the collision.<sup>122</sup> “With a dual-level inflator, if the sensor system detects a severe collision, the airbag deploys aggressively; if the collision is mild, the airbag deploys less forcefully.”<sup>123</sup> “Airbags need to inflate most quickly in severe collisions, as the occupants move forward more quickly than they do in less forceful collisions.”<sup>124</sup> To prevent the front passenger airbag from deploying when the front passenger seat is not occupied, the central control unit is linked to a seat occupancy recognition mechanism.<sup>125</sup> Before the system deploys the airbag, the sensors in the front passenger seat must report to the airbag control unit that the seat is occupied.<sup>126</sup>

The airbag “inflates at a rate of approximately 100-200 miles per hour within a period of thirty to fifty milliseconds,”<sup>127</sup> and “[t]he airbag deployment lasts about half of one second.”<sup>128</sup> The nitrogen gas that inflates the airbag dissipates through tiny holes in the airbag within seconds.<sup>129</sup> The deployment of the airbag will usually release various kinds of dust and chemicals that can irritate the eyes and skin.<sup>130</sup> Furthermore, the speed at which the airbag deploys can cause abrasions or burns,<sup>131</sup> and the chemicals that are released upon deployment can irritate—or even cause—asthma attacks.<sup>132</sup> Airbags can also cause eye injuries when they strike individuals.<sup>133</sup>

Besides front airbags, many cars are also equipped with side airbags. “Side airbags are inflatable devices that are designed to help protect [the vehicle occupant’s] head and/or chest in the event of a serious”

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<sup>120</sup> Ahmad, *supra* note 93, at 69.

<sup>121</sup> *Id.*

<sup>122</sup> Baron, *The ‘Smart’ Airbag Case*, *supra* note 9, at 43.

<sup>123</sup> *Id.*

<sup>124</sup> *Id.*

<sup>125</sup> SEIFFERT & WECH, *supra* note 95, at 174.

<sup>126</sup> *Id.*

<sup>127</sup> Olufunmilola Ogun, Sewuese Ikyaa, & Gabriel Ogun, *Rethinking Airbag Safety: Airbag Injury causing Bilateral Blindness*, 21 MIDDLE E. AFRICAN J. OF OPHTHALMOLOGY 196 (2014), available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4005189/>.

<sup>128</sup> Smalley, *supra* note 92.

<sup>129</sup> Newlin, *supra* note 96.

<sup>130</sup> Ogun, Ikyaa, & Ogun, *supra* note 127.

<sup>131</sup> Ahmad, *supra* note 93.

<sup>132</sup> Manoj K. Mittal, Michael J. Kallan, & Dennis R. Durbin, *Breathing Difficulty and Tinnitus Among Children Exposed to Airbag Deployment*, ACCIDENT ANALYSIS & PREVENTION 624, 624 (2007).

<sup>133</sup> Ogun, Ikyaa, & Ogun, *supra* note 127.

side-impact collision.<sup>134</sup> The goal of the side airbag is to keep the occupant away “and dampening the blow from the intruding side of the vehicle.”<sup>135</sup> “Engineers say that designing effective side airbags is much more difficult than designing front airbags. This is because much of the energy from a front-impact collision is absorbed by the bumper, hood, and engine, and it takes almost thirty to forty milliseconds before [the impact] reaches the car’s occupants.”<sup>136</sup> However, in a side-impact collision, “only a relatively thin door and a few inches separate the occupant from [the other] vehicle,” so a door-mounted airbag must begin to deploy in five or six milliseconds.<sup>137</sup>

The three main types of side airbags are the head airbag, the chest airbag, and the head/chest combination airbag.<sup>138</sup> The head airbags “are usually mounted in the roof rail above the side windows and are designed to help protect an adult’s head in a side-impact” collision.<sup>139</sup> The chest airbags are typically “mounted in the side of the seat or in the door,”<sup>140</sup> and they “inflate between the seat occupant and the door.”<sup>141</sup> The head/chest combination airbags “are usually mounted in the side of the seat and are typically larger than chest” side airbags.<sup>142</sup> “The advantage of having the airbag module mounted in the back-rest” of a front seat is that the airbag module “will move with the seat and give optimal protection for” occupants of all sizes.<sup>143</sup>

When a collision occurs at about twelve miles per hour, the sensors normally trigger the side airbags to inflate, but “[u]nlike frontal airbags, some of the [head airbags] may stay inflated for several seconds during a crash for additional protection in the event of a rollover.”<sup>144</sup> The automobile manufacturers must carefully place the sensors that trigger the side airbags so that they are as close as possible to the doors and also located in the area where the passenger compartment remains intact.<sup>145</sup> In addition to being carefully positioned, the sensors must also be correctly calibrated so that the airbags will deploy at the right time and with the right amount of force.<sup>146</sup>

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<sup>134</sup> NHTSA, *supra* note 87.

<sup>135</sup> AUTOLIV, *Side Airbags*, <http://www.autoliv.com/productsandinnovations/passivesafety/systems/pages/airbags/sideairbags.aspx>.

<sup>136</sup> Brain, *supra* note 91.

<sup>137</sup> *Id.*

<sup>138</sup> NHTSA, *supra* note 87.

<sup>139</sup> *Id.*

<sup>140</sup> *Id.*

<sup>141</sup> AUTOLIV, *supra* note 135.

<sup>142</sup> NHTSA, *supra* note 87.

<sup>143</sup> AUTOLIV, *supra* note 135.

<sup>144</sup> NHTSA, *supra* note 87.

<sup>145</sup> SEIFFERT & WECH, *supra* note 95, at 209.

<sup>146</sup> *Id.*

## IV. PROBLEMS WITH AIRBAGS

As of January 1, 2009, the National Highway Traffic Safety Administration attributed “296 deaths to frontal airbags, including 191 children, 92 drivers, and 13 adult passengers.”<sup>147</sup> “Airbag systems are designed to reduce driver and passenger injuries in a motor vehicle collision, particularly collisions at high speeds.”<sup>148</sup> The airbags are not designed to deploy during the normal operation of the vehicle, such as braking or hitting bumps in the road.<sup>149</sup> However, airbags have deployed incorrectly or malfunctioned due to defects in their designs, and the airbag’s incorrect deployment or malfunction has caused serious injuries and death for vehicle occupants, regardless of the speeds at which their cars were traveling.<sup>150</sup>

In high-speed crashes, drivers and passengers have been seriously injured or killed when the airbags failed to deploy at all or when the airbags deployed too slowly or too quickly.<sup>151</sup> In low-speed crashes, airbags have deployed too forcefully and have caused more damage to the drivers and passengers than had the airbags not deployed.<sup>152</sup> There have also been instances where the airbag inflator shot out metal shrapnel when the airbag deployed.<sup>153</sup> Furthermore, deployed airbags have failed to deflate, causing vehicle occupants to suffocate.<sup>154</sup>

“The most frequent airbag injuries are bruises or abrasions to the face, neck, chest, or arms.”<sup>155</sup> Drivers have also sustained fractured fingers, wrists, or arms because their hands and arms are closest to the airbags when they deploy.<sup>156</sup> The chemical propellants that cause the airbags to inflate use hot gases, and vehicle occupants who have been too close to the airbags when they deployed have been burned by the gases.<sup>157</sup> Defectively designed airbags have caused “brain hemorrhages, burst hearts, severed brain stems, spinal injury, broken necks, blindings, TMJ (Temporomandibular joint dysfunction) syndrome, facial bone fractures, upper extremity injuries, and disfigurement.”<sup>158</sup> In many cases, unsuspecting vehicle occupants would not have been paralyzed or killed if the airbag that was deployed had not

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<sup>147</sup> Ins. Inst. for Highway Safety, *supra* note 1, at 1.

<sup>148</sup> Uustal, *supra* note 2.

<sup>149</sup> Ferguson, Segui-Gomez, & Simons, *supra* note 58, at 35.

<sup>150</sup> Uustal, *supra* note 2.

<sup>151</sup> *Id.* .

<sup>152</sup> Jesse Patterson, *The Engineering Behind Automotive Airbags*, ILLUMIN, Oct. 15, 2014, <http://www.illuminate.usc.edu/88/the-engineering-behind-automotive-airbags/>.

<sup>153</sup> James R. Healey, *Feds Confused, Automakers Alarmed Over Takata Airbags*, USA TODAY, Oct. 22, 2014.

<sup>154</sup> Uustal, *supra* note 2.

<sup>155</sup> Ferguson, Segui-Gomez, & Simons, *supra* note 58, at 36.

<sup>156</sup> *Id.*

<sup>157</sup> *Id.* at 34.

<sup>158</sup> Uustal, *supra* note 2.

been defectively designed.<sup>159</sup> In addition to traumatic injuries, airbag exposure has been linked to breathing difficulties and hearing loss.<sup>160</sup>

Airbags inflate very quickly in a crash, and they have injured and even killed an unbuckled child or adult who was sitting too closely to the airbag or who was thrown toward the dashboard during emergency braking.<sup>161</sup> Airbags also do not work with infants who are placed in rear-facing child seats in the front.<sup>162</sup> The back of a rear-facing child seat sits very closely to the dashboard, and the airbag could strike the seat “with enough force to cause serious, or even fatal injuries to a baby.”<sup>163</sup> Even older children and small adults are at risk from a deploying airbag when they are not properly restrained with seatbelts.<sup>164</sup>

Although the more recent advanced airbags deploy with less force than the airbags that were used before 1996, Adrian Lund, the President of the Insurance Institute for Highway Safety, noted that advanced airbags may still be “too aggressive.”<sup>165</sup> Furthermore, Lund stated that, “[i]t’s also possible that advanced deployment [procedures] result in some airbags not deploying at all when they would be beneficial.”<sup>166</sup> Lund acknowledged that advances have been made to the airbags over the years, but airbags still have problems in their design that have resulted in serious or even fatal injuries.<sup>167</sup>

## V. RECALL OF DEFECTIVE AIRBAGS

Over the years, automobile manufacturers have recalled vehicles due to a variety of safety defects. One of the largest recalls in history, however, was that of airbags manufactured by a Japanese supplier by the name of the Takata Corporation.<sup>168</sup> Eleven automobile manufacturers, including Honda, Toyota, Ford, Nissan, BMW, Subaru, Mazda, Isuzu, Mitsubishi, Chrysler, and General Motors,<sup>169</sup> have recalled more than fourteen million vehicles that are equipped with the Takata airbags.<sup>170</sup> The explosive propellants that were used in the defective airbags “burn more

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<sup>159</sup> *Id.*

<sup>160</sup> Mittal, Kallan, & Durbin, *supra* note 111.

<sup>161</sup> ESSENTIAL GUIDE TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (Progressive Management CD-ROM, 2006) [For full fact sheet, please visit <http://www.nhtsa.gov/people/injury/airbags/Airbags.html> – Ed.].

<sup>162</sup> *Id.*

<sup>163</sup> *Id.*

<sup>164</sup> *Id.*

<sup>165</sup> Ins. Inst. for Highway Safety, *supra* note 1, at 4.

<sup>166</sup> *Id.*

<sup>167</sup> *Id.*

<sup>168</sup> Stout, Ivory, & Ruiz, *supra* note 10.

<sup>169</sup> Tabuchi, *supra* note 9.

<sup>170</sup> Your Guide to the Explosive Airbag Recall that Affects 14 Million Cars, <http://www.jalopnik.com/your-guide-to-the-explosive-airbag-recall-that-affects-1634598717>.

aggressively than they should, causing the” inflator’s metal case to burst.<sup>171</sup> When the inflator bursts, shards of metal are sent flying through the airbag fabric into the passenger compartment.<sup>172</sup> The shards of metal have struck drivers and passengers and caused at least 139 injuries<sup>173</sup> and 4 deaths.<sup>174</sup>

Takata, one of the largest airbag manufacturers in the world, has about twenty percent of the airbag market.<sup>175</sup> The airbags that are now being recalled were developed by Takata “in the late 1990s in an attempt to reduce the toxic fumes that plagued earlier airbags.”<sup>176</sup> However, “[d]ozens of internal Takata engineering reports, presentations and copies of emails reviewed by Reuters show the company struggled to meet its own safety standards in manufacturing the airbag inflators” from 2000 to 2011.<sup>177</sup> The documents also show that the inflators, which were manufactured in Takata’s Mexico plant, may not have been sealed air-tight<sup>178</sup> and that excessive moisture and humidity may have been “seeping inside the inflators, destabilizing the volatile propellant inside.”<sup>179</sup> Takata has even acknowledged that in the Mexican plant, “it had improperly stored chemicals and had mishandled the manufacture of the explosive propellants” that are used to inflate the airbags.<sup>180</sup>

In May 2004, the first airbag explosion occurred in a Honda Accord in Alabama.<sup>181</sup> The airbag shot out metal fragments and injured the car’s driver.<sup>182</sup> Honda and Takata could not find a reasonable explanation concerning why the airbag ruptured, so they deemed the ruptured airbag “an anomaly.”<sup>183</sup> Despite three additional incidents in 2007 in which the airbags ruptured, Honda and Takata did not issue a safety recall until late 2008.<sup>184</sup> In each of the four incidents, Honda entered into confidential settlements with the people who were injured by the airbags.<sup>185</sup> By law, automakers are required to report to the National Highway Traffic Safety Administration

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<sup>171</sup> *Id.*

<sup>172</sup> *Id.*

<sup>173</sup> Tabuchi, *supra* note 10.

<sup>174</sup> Ben Klayman & Brabara Liston, *Fourth US Traffic Death Linked to Takata Airbags*, BANGOR DAILY NEWS, Oct. 18, 2014.

<sup>175</sup> Hiroko Tabuchi & Christopher Jensen, *Now the Airbags Are Faulty Too: Takata Acknowledges Poor Records in Airbag Recall*, N.Y. TIMES, June 24, 2014, at B1.

<sup>176</sup> Your Guide to the Explosive Recall, *supra* note 170.

<sup>177</sup> Joanna Zuckerman Bernstein, Ben Klayman & Yoko Kubota, *Exclusive: Takata Engineers Struggled to Maintain Airbag Quality, Documents Reveal*, THOMSON REUTERS (Oct. 17, 2014), <http://www.reuters.com/article/2014/10/18/us-takata-airbags-idUSKCN0I701B20141018>.

<sup>178</sup> *Id.*

<sup>179</sup> Tabuchi & Jensen, *supra* note 175.

<sup>180</sup> *Id.*

<sup>181</sup> Tabuchi, *supra* note 10.

<sup>182</sup> *Id.*

<sup>183</sup> *Id.*

<sup>184</sup> *Id.*

<sup>185</sup> *Id.*

any claims blaming vehicle defects for serious injuries or deaths.<sup>186</sup> Honda did file a standard report with the National Highway Traffic Safety Administration “on the initial airbag injury in 2004, and followed up with similar filings on the incidents in 2007.”<sup>187</sup> Although Honda knew that the airbags posed an explosion risk, Honda did not disclose this risk to the agency.<sup>188</sup> In addition, the NHTSA never followed up with Honda regarding what may have caused the airbags to rupture.<sup>189</sup>

Honda and Takata did not disclose the information about the exploding airbags to the public for years after the first reported incident that occurred in 2004.<sup>190</sup> Furthermore, when Honda issued its first recall in November 2008, it only recalled 4,205 Accords and Civics over possible airbag explosions.<sup>191</sup> Honda reported to the “regulators that it had identified all ‘possible vehicles that could potentially experience the problem.’”<sup>192</sup> “Six months later, after a teenager was killed in her Accord by shrapnel from an exploding airbag, [Honda] recalled more than 510,000 additional [vehicles].”<sup>193</sup>

The National Highway Traffic Safety Administration has also been slow in responding to the problems of the exploding airbags.<sup>194</sup> The agency did not begin an investigation until after Honda’s second recall.<sup>195</sup> Furthermore, when the agency did finally open the investigation in 2009, its initial efforts were so cursory that it closed the investigation before Takata was able to provide all of the relevant documents.<sup>196</sup> After a brief inquiry, the agency concluded that “there are no additional vehicles to be investigated.”<sup>197</sup> However, less than a year after the NHTSA closed its investigation, “further cases of rupturing airbags prompted Honda to resume its recalls.”<sup>198</sup>

Takata and Honda knew about the problems with the airbags for years, but their reluctance to disclose the problems delayed other automakers from issuing their own recalls.<sup>199</sup> Takata originally claimed that the airbags installed in BMW vehicles were not defective, but in 2013, Takata acknowledged that BMW’s airbags could also potentially rupture.<sup>200</sup>

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<sup>186</sup> Stout, Ivory, & Ruiz, *supra* note 11.

<sup>187</sup> Tabuchi, *supra* note 10.

<sup>188</sup> *Id.*

<sup>189</sup> *Id.*

<sup>190</sup> *Id.*

<sup>191</sup> Stout, Ivory, & Ruiz, *supra* note 11.

<sup>192</sup> Tabuchi, *supra* note 10.

<sup>193</sup> Stout, Ivory, & Ruiz, *supra* note 11.

<sup>194</sup> *Id.*

<sup>195</sup> *Id.*

<sup>196</sup> *Id.*

<sup>197</sup> *Id.*

<sup>198</sup> *Id.*

<sup>199</sup> Tabuchi, *supra* note 10.

<sup>200</sup> *Id.*

“Takata’s acknowledgment of the broader problem [with the airbags] has led nine [other] automakers also to issue recalls.”<sup>201</sup> Takata kept inadequate quality-control records over the years, “making it difficult to identify vehicles with potentially defective airbags.”<sup>202</sup> Automobile manufacturers moved to recall more than three million vehicles in June 2014 because of the possibility that the airbags could rupture.<sup>203</sup>

Takata’s potentially defective airbags have not been the only airbags to be recalled over the years. Automobile manufacturers have also had to recall airbags manufactured by other suppliers because they deployed too forcefully, deployed at improper times, or failed to deploy when they should have.<sup>204</sup> Furthermore, the manufacturers have faced numerous lawsuits because of the injuries and deaths that the defective airbags have caused.<sup>205</sup>

## VI. LITIGATION INVOLVING AIRBAGS THAT FAIL TO DEPLOY

In *Estep v. Mike Ferrell Ford Lincoln-Mercury, Inc.*, the plaintiff filed a lawsuit against the manufacturer in which she alleged that her Ford Ranger was defective because the airbag “failed to deploy and protect [her] during a single vehicle crash.”<sup>206</sup> While the plaintiff was driving alone, she drove over an oil slick on the road and lost control of her vehicle.<sup>207</sup> According to the plaintiff, her vehicle went over an embankment, traveled thirty feet down a hill, crashed into a tree, and finally stopped in a riverbed.<sup>208</sup> “The airbag on the driver’s side of the vehicle failed to deploy during the accident, and [the plaintiff] sustained back injuries that required extensive surgery to repair.”<sup>209</sup> The plaintiff alleged that her injuries “occurred as a result of her body being thrown forward over the steering wheel when” her vehicle hit the tree.<sup>210</sup>

The manufacturer, however, maintained that the vehicle became airborne when it went over the embankment, struck a tree while descending through the air, and then forcefully landed in the riverbed.<sup>211</sup> The manufacturer contended that the plaintiff’s “back was injured when the [vehicle] landed on all four wheels in the riverbed.”<sup>212</sup> The jury in the

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<sup>201</sup> *Id.*

<sup>202</sup> Tabuchi & Jensen, *supra* note 175.

<sup>203</sup> *Id.*

<sup>204</sup> *Defective Airbags*, YOUR LEGAL GUIDE, <http://www.yourlegalguide.com/defective-airbags>.

<sup>205</sup> Baron, *The ‘Smart’ Airbag Case*, *supra* note 9, at 40.

<sup>206</sup> *Estep v. Mike Ferrell Ford Lincoln-Mercury, Inc.*, 672 S.E.2d 345, 349 (W. Va. 2008).

<sup>207</sup> *Id.*

<sup>208</sup> *Id.* at 350.

<sup>209</sup> *Id.*

<sup>210</sup> *Id.*

<sup>211</sup> *Id.*

<sup>212</sup> *Id.*

circuit court returned a verdict for the plaintiff, and the judge entered a judgment in favor of the plaintiff in the amount of \$993,157.50.<sup>213</sup>

The manufacturer appealed the circuit court's judgment, but the West Virginia Supreme Court of Appeals held that the evidence was sufficient to support the jury's findings that the vehicle's airbag was defective and that the defect caused the plaintiff's injuries.<sup>214</sup> An "engineer testified that according to automotive industry standards an airbag is expected to deploy in a severe crash" when the risk of serious injury or death to the occupants of the vehicle is greater than 25 percent.<sup>215</sup> The engineer explained that given the industry standards, the airbag should have deployed whether the plaintiff's vehicle hit the tree head-on or less directly.<sup>216</sup>

The supreme court of appeals used the standard established in *Morningstar v. Black & Decker Manufacturing Co.* to determine whether the vehicle's airbag was defective.<sup>217</sup> The relevant standard under *Morningstar* states that a product is defective if "it is not reasonably safe for its intended use."<sup>218</sup> The standard of reasonable safeness is determined "by what a reasonably prudent manufacturer's standards should have been at the time the product was made."<sup>219</sup> Based on the evidence and the engineer's testimony, the supreme court of appeals concluded that the vehicle's airbag was defective under the standard established in *Morningstar*.<sup>220</sup>

In *General Motors Corp. v. Burry*, plaintiffs, who were husband and wife, filed a lawsuit against the car manufacturer because the side airbag failed to deploy when it should have, and the vehicle failed to have an airbag or curtain to protect the vehicle occupant's head.<sup>221</sup> The wife, who was a passenger in a 2001 Chevrolet Suburban, sustained permanent brain damage in an automobile collision with an eighteen-wheeler.<sup>222</sup> The eighteen-wheeler was traveling at approximately forty-three miles per hour when it initially impacted the Suburban, and then at thirty-nine miles per hour when it impacted the side of the Suburban.<sup>223</sup>

The jury found that the car manufacturer was liable because of the design defect in the Suburban,<sup>224</sup> and the jury awarded the plaintiffs \$19.1

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<sup>213</sup> *Id.*

<sup>214</sup> *Id.* at 349.

<sup>215</sup> *Id.* at 355.

<sup>216</sup> *Id.* at 355-56.

<sup>217</sup> *Id.* at 355 (citing *Morningstar v. Black & Decker Mfg. Co.*, 253 S.E.2d 666 (W. Va. 1979)).

<sup>218</sup> *Id.*

<sup>219</sup> *Id.*

<sup>220</sup> *Id.* at 356.

<sup>221</sup> *General Motors Corp. v. Burry*, 203 S.W.3d 514, 526 (Tex. App. 2006).

<sup>222</sup> *Id.* at 524.

<sup>223</sup> *Id.* at 530.

<sup>224</sup> *Id.* at 524.

million “for past and future pain and suffering and mental anguish, loss of future earning capacity, and future physical impairment.”<sup>225</sup> The car manufacturer appealed the verdict, but the court of appeals affirmed the lower court’s findings.<sup>226</sup> The plaintiffs’ expert witness testified that the side impact “was sufficiently severe to require deployment of the side airbag.”<sup>227</sup> When the eighteen-wheeler struck the Suburban, “[t]he interior of the Suburban intruded into the passenger compartment about eight to ten inches at the top and about twelve inches at the level of the window sill.”<sup>228</sup> The court of appeals held “that a side airbag design that did not allow for the side airbag to deploy in this type of crash was unreasonably dangerous based on the severity of the crash.”<sup>229</sup>

According to the plaintiffs, there was a safer alternative design than the car manufacturer’s single-sensor side airbag.<sup>230</sup> The plaintiffs “proposed the addition of a second side airbag sensor to be used alone or, optimally, in combination with inflatable head protection.”<sup>231</sup> The plaintiffs’ expert witness testified that the car manufacturer chose a system with only one sensor even though it did not meet the requirements for many potential crashes.<sup>232</sup> The expert stated that a second side airbag sensor would “make the sensing system twice as smart”<sup>233</sup> and that a two-sensor system would have prevented or reduced the risk of the passenger’s injuries.<sup>234</sup> The court of appeals concluded that the automobile manufacturer could have created a safer alternative design for its side airbag system.<sup>235</sup>

Justice Terrie Livingston, who delivered the opinion in *General Motors*, stated that the evidence at trial showed that the plaintiff “continued to suffer from physical limitations such as blurred vision, light sensitivity, abnormal voice tenor, loss of flexibility and balance, weakness on the right side of her body, and spasticity.”<sup>236</sup> Furthermore, as a result of her mental impairment, the plaintiff “could not read to her children, drive a car, or live without supervision.”<sup>237</sup> Based on the evidence, Justice Livingston held “that the jury’s award for future physical impairment was not excessive.”<sup>238</sup>

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<sup>225</sup> *Id.* at 555.

<sup>226</sup> *Id.* at 524.

<sup>227</sup> *Id.* at 531.

<sup>228</sup> *Id.*

<sup>229</sup> *Id.*

<sup>230</sup> *Id.* at 533.

<sup>231</sup> *Id.*

<sup>232</sup> *Id.* at 534.

<sup>233</sup> *Id.*

<sup>234</sup> *Id.* at 533.

<sup>235</sup> *Id.* at 536.

<sup>236</sup> *Id.* at 555.

<sup>237</sup> *Id.*

<sup>238</sup> *Id.*

In *Kaplan v. Daimlerchrysler*, the plaintiff sued the automobile manufacturer for a defect in his vehicle after the plaintiff's 1999 Mercedes was struck on the driver's side by another vehicle.<sup>239</sup> Upon impact, the driver's side window broke, [the plaintiff's] arm exited out the broken window, and his arm became pinned between the two vehicles.<sup>240</sup> The driver's airbag did not deploy, and as a result of the accident, the plaintiff suffered severe injuries, including the amputation of his arm.<sup>241</sup> The district court awarded the plaintiff \$1,500,000 in damages and also awarded the plaintiff's wife \$750,000 for "loss of [the plaintiff's] services, comfort, society, and attention."<sup>242</sup> A medical expert testified that if the driver's airbag had deployed, then the airbag would have prevented the arm injury.<sup>243</sup> The expert further stated "that he was familiar with the number of milliseconds that it takes for" an airbag to inflate, and that if the airbag "had deployed, it 'would have trapped [the plaintiff's] arm and kept him inside the car.'"<sup>244</sup> The court in *Kaplan* concluded that the jury's verdict was supported by the evidence and that no reversible error existed in the trial.<sup>245</sup>

#### VII. LITIGATION INVOLVING DELAYS IN AIRBAGS' DEPLOYMENTS

In *Morton International v. Gillespie*, the plaintiff filed an action against the manufacturer of the airbag assembly for injuries that the plaintiff suffered as a result of an allegedly delayed airbag deployment following a car crash.<sup>246</sup> While the plaintiff was stopped at an intersection, another vehicle collided into her Plymouth Voyager minivan.<sup>247</sup> As a result of the impact, the plaintiff was pushed forward within three to four inches of the steering wheel, and when the airbag deployed, it struck the plaintiff's face at approximately 200 miles per hour.<sup>248</sup> The plaintiff "sustained severe injuries to the right side of her face."<sup>249</sup> After a bench trial, the court awarded the plaintiff \$950,000 in damages.<sup>250</sup>

The manufacturer appealed the lower court's ruling and argued "that the trial court erred by allowing [the plaintiff's expert], a mechanical engineer, to testify as an expert about an alleged manufacturing defect in [the] airbag."<sup>251</sup> However, the court of appeals held "that based on [the

<sup>239</sup> *Kaplan v. Daimlerchrysler*, No. 02-13223, 2003 WL 22023315, at \*1 (11th Cir. 2003).

<sup>240</sup> *Id.*

<sup>241</sup> *Id.*

<sup>242</sup> *Id.*

<sup>243</sup> *Id.* at \*6.

<sup>244</sup> *Id.*

<sup>245</sup> *Id.* at \*7.

<sup>246</sup> *Morton Int'l v. Gillespie*, 39 S.W.3d 651, 654 (Tex. App. 2001).

<sup>247</sup> *Id.*

<sup>248</sup> *Id.*

<sup>249</sup> *Id.*

<sup>250</sup> *Id.*

<sup>251</sup> *Id.*

mechanical engineer's] education and experience, he was qualified to give expert testimony to these aspects of airbag deployment and delayed deployment as it affected [the plaintiff's] movement."<sup>252</sup> The engineer had used a computer program to show that the only way that the plaintiff could have come within three to four inches of the steering wheel "was if the airbag did not deploy within the fifty milliseconds as it was designed."<sup>253</sup> The deployment of the airbag was actually delayed for approximately 120 milliseconds.<sup>254</sup>

In *Morton*, Chief Justice Cornelius stated that the combined testimony of the plaintiff and the mechanical engineer "provide[d] more than a scintilla of evidence to support the finding that the airbag did not deploy within the fifty milliseconds for which it was designed. . . ."<sup>255</sup> Furthermore, Justice Cornelius noted that "a delay in deployment of between sixty to seventy milliseconds constituted a manufacturing defect."<sup>256</sup> Therefore, the court of appeals held that the airbag malfunctioned and that the delay in the airbag's deployment "was a producing cause of [the plaintiff's] injuries."<sup>257</sup>

In *Evans v. Ford Motor Co.*, the plaintiff sued the automobile manufacturer after his wife died in a car crash.<sup>258</sup> The plaintiff's wife died instantly when her Ford Ranger struck a pole in a parking lot and the airbag deployed.<sup>259</sup> The plaintiff argued that the airbag took twice as long to deploy as it should have; and that rather than cushioning his wife from the accident's impact, the airbag provided the blow that killed her.<sup>260</sup> The defense contended that although the passenger's airbag deployed at precisely the same time as the driver's airbag, the front seat passenger was not injured.<sup>261</sup> However, the plaintiff presented evidence from the Ranger's data recorder, which showed that the airbags deployed late, and the plaintiff won \$1.5 million.<sup>262</sup>

#### VIII. LITIGATION INVOLVING AIRBAGS THAT DEPLOY WHEN THEY SHOULD NOT DEPLOY AT ALL

In *Harris v. General Motors Corp.*, the plaintiff filed a lawsuit against the automobile manufacturer because the airbag in her Chevrolet Corsica allegedly deployed after her accident had occurred and caused her

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<sup>252</sup> *Id.* at 656.

<sup>253</sup> *Id.*

<sup>254</sup> *Id.*

<sup>255</sup> *Id.* at 657.

<sup>256</sup> *Id.*

<sup>257</sup> *Id.* at 658.

<sup>258</sup> *Evans v. Ford Motor Co.*, No. 01 CV 401 (N.D. Ill. 2002).

<sup>259</sup> *Id.*

<sup>260</sup> *Id.*

<sup>261</sup> *Id.*

<sup>262</sup> *Id.*

injuries.<sup>263</sup> When the plaintiff “attempted to turn left into a parking lot, [she] accidentally turn[ed] into the path of an on-coming vehicle.”<sup>264</sup> The vehicle hit her Corsica at a relatively low speed, and the plaintiff, who was wearing her seatbelt, was not injured in the initial crash.<sup>265</sup> However, the plaintiff testified “that immediately after the crash, when she reached with her right hand to turn off the ignition, the airbag in her Corsica deployed, hitting her in the face, wrapping itself around her right arm and breaking that arm.”<sup>266</sup> The plaintiff’s only passenger “confirmed that the airbag did not deploy until after the accident.”<sup>267</sup> The court of appeals held that the plaintiff provided sufficient evidence for a jury to conclude that the airbag was defective in that it deployed after the accident had occurred.<sup>268</sup>

In *Estate of Semidey v. Ford Motor Co.*, the estate of a single mother who was killed in a crash sued the automobile manufacturer.<sup>269</sup> The mother lost control of her Ford Taurus and struck a concrete wall while she was driving only nine miles per hour onto an entrance ramp to the turnpike. Upon impact, the driver’s airbag deployed and hit the mother, who died within a few minutes.<sup>270</sup> Her estate argued that an airbag is not needed until about sixteen miles per hour and that the manufacturer’s decision to have airbags deploy in crashes below ten miles per hour was unreasonably dangerous.<sup>271</sup>

The parties disagreed regarding whether the mother was wearing a seatbelt at the time of the crash.<sup>272</sup> However, her estate contended that for an additional \$20 per vehicle, the manufacturer could have used a “dual-level” inflation airbag system that would sense when someone is wearing a seatbelt and would not deploy at a low speed.<sup>273</sup> The jury awarded the estate \$3.3 million because the jury was convinced that the airbag was unreasonably dangerous as designed due to its potential to cause injuries and death in low-speed crashes where consumers would otherwise not be injured.<sup>274</sup>

In *McEneaney v. Haywood*, the plaintiff filed a lawsuit after she allegedly sustained injuries from the improper deployment of an airbag.<sup>275</sup> The plaintiff brought an action against the defendant and alleged “strict

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<sup>263</sup> *Harris v. Gen. Motors Corp.*, 201 F.3d 800, 802 (6th Cir. 2000).

<sup>264</sup> *Id.* at 801.

<sup>265</sup> *Id.* at 802.

<sup>266</sup> *Id.*

<sup>267</sup> *Id.*

<sup>268</sup> *Id.* at 804.

<sup>269</sup> *Estate of Semidey v. Ford Motor Co.* (Fla. Cir. Ct. 2003).

<sup>270</sup> *Id.*

<sup>271</sup> *Id.*

<sup>272</sup> *Id.*

<sup>273</sup> *Id.*

<sup>274</sup> *Id.*

<sup>275</sup> *McEneaney v. Haywood*, 687 N.Y.S.2d 547, 551 (App. Div. 1999).

products liability, breach of warranty, negligence, and failure to warn.”<sup>276</sup> The plaintiff, who was driving a rental car, testified that she was involved in a minor accident with another vehicle at an intersection, but she was not hurt as a result of the collision itself.<sup>277</sup> However, about twenty seconds after the car crash, she heard a hissing noise, and the airbag started to inflate slowly.<sup>278</sup> The plaintiff contended “that some type of gas, or acid, began spewing out of the lower half of the steering wheel as the bag inflated partially and slowly and that it burned her hands and face.”<sup>279</sup>

The plaintiff claimed that the improper deployment of the airbag and not the car accident caused her injuries.<sup>280</sup> The court in *McEneaney* concluded that if the sensors had worked properly, the minor impact from the car accident would not have caused the airbag to deploy.<sup>281</sup> Furthermore, the airbag did not perform as intended when it deployed slowly and sprayed acid or chemicals on the plaintiff’s hands and face.<sup>282</sup>

#### IX. LITIGATION INVOLVING AIRBAGS THAT DEPLOY TOO FORCEFULLY

In *Gonzalez v. Autoliv ASP, Inc.*, the plaintiff, who was a passenger in a Ford Taurus, sued the airbag manufacturer because during a vehicle collision the airbag “allegedly deployed with excessive and dangerous force causing damage to [her] right eye.”<sup>283</sup> A mechanical engineering expert stated that “[a]t the time the 1998 Ford Taurus passenger airbag system was being engineered, [the defendant airbag manufacturer] knew or should have known that a phenomenon known as ‘bag slap’ from a deploying airbag could cause eye injuries.”<sup>284</sup> Furthermore, the airbag manufacture “did not conform to prudent engineering practices by failing to consider the risk of eye injuries when designing, manufacturing and supplying the 1998 Ford Taurus passenger airbag module to . . . Ford.”<sup>285</sup>

The expert witness further stated that “[a] reasonably prudent airbag system design engineer would have evaluated the results of testing of the 1998 Ford Taurus passenger airbag system to determine whether the deploying bag would strike the passenger’s head in a potentially injurious manner.”<sup>286</sup> According to the expert witness, the “plaintiff has received no evidence to suggest that such an appropriate evaluation was conducted during the design and testing of the 1998 Ford Taurus passenger airbag

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<sup>276</sup> *Id.* at 548.

<sup>277</sup> *Id.*

<sup>278</sup> *Id.*

<sup>279</sup> *Id.*

<sup>280</sup> *Id.* at 551.

<sup>281</sup> *Id.* at 550.

<sup>282</sup> *Id.* at 551.

<sup>283</sup> *Gonzalez v. Autoliv ASP, Inc.*, 154 Cal. App. 4th 780, 783-84 (Ct. App. 2007).

<sup>284</sup> *Id.* at 785.

<sup>285</sup> *Id.*

<sup>286</sup> *Id.* at 785-86.

system.”<sup>287</sup> The airbag manufacturer also could not provide any evidence that the benefits of the airbag design outweighed its inherent risks.<sup>288</sup> Therefore, the court of appeals in *Gonzalez* held that the plaintiff offered sufficient evidence for a jury to conclude that a design feature of the airbag caused the plaintiff’s injury.<sup>289</sup>

In *Connelly v. Hyundai Motor Co.*, the administrator of a passenger’s estate brought an action against the automobile manufacturer for negligently designing an overly aggressive airbag, which killed the passenger in a car accident.<sup>290</sup> The passenger was in the front seat of a Hyundai Sonata when at an intersection, the Sonata was struck by another car on the right side.<sup>291</sup> “The collision pushed the Sonata into a light pole. Upon striking the light pole, the Sonata’s driver and passenger airbags deployed.”<sup>292</sup> The airbag struck the passenger “with such force that it severed his spinal cord from his brain and killed him.”<sup>293</sup> The jury found that the automobile manufacturer “failed to exercise reasonable care in designing and testing the airbag in the 1995 Hyundai Sonata, and . . . that Hyundai’s failure to exercise reasonable care in designing or testing the airbag . . . caused or contributed to” the passenger’s death.<sup>294</sup>

In *Morris v. Mitsubishi Motors North America, Inc.*, the plaintiff suffered severe injuries after the airbag in her Mitsubishi Eclipse deployed.<sup>295</sup> The plaintiff was driving her Mitsubishi “when her car struck a flat-bed truck that had stopped for a bus.”<sup>296</sup> “The front end of . . . [the plaintiff’s] car rear-ended . . . [the] truck and went underneath the truck’s back platform in the collision.”<sup>297</sup> The airbag deployed rapidly, struck the plaintiff’s head and neck, and severed her spinal cord.<sup>298</sup> “The parties agree[d] that . . . [the plaintiff’s] injuries resulted from the airbag deployment and not from the impact of the [car] collision.”<sup>299</sup>

The plaintiff argued that the airbag deployed too forcefully and too late.<sup>300</sup> The plaintiff’s expert witness testified that the crash sensors in the Mitsubishi were “overly sensitive to low speed impacts” and that the airbag deployment threshold was set too low.<sup>301</sup> The crash sensors also deployed

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<sup>287</sup> *Id.* at 786.

<sup>288</sup> *Id.* at 787.

<sup>289</sup> *Id.* at 791.

<sup>290</sup> *Connelly v. Hyundai Motor Co.*, 351 F.3d 535, 537 (1st Cir. 2003).

<sup>291</sup> *Id.*

<sup>292</sup> *Id.*

<sup>293</sup> *Id.* at 538.

<sup>294</sup> *Id.* at 541.

<sup>295</sup> *Morris v. Mitsubishi Motors N. Am., Inc.*, 782 F. Supp. 2d 1149, 1152 (E.D. Wash. 2011).

<sup>296</sup> *Id.* at 1151.

<sup>297</sup> *Id.*

<sup>298</sup> *Id.* at 1152.

<sup>299</sup> *Id.*

<sup>300</sup> *Id.* at 1156.

<sup>301</sup> *Id.*

the airbag too late because the airbag deployed after the plaintiff had already been thrust forward due to the force of the collision.<sup>302</sup> Furthermore, the expert witness testified that “[t]he determination of the airbag deployment thresholds were erroneously established based on inadequate testing and development.”<sup>303</sup> The court agreed, stating that there was a genuine issue of “material fact as to whether the airbag deployment parameters were reasonably safe as designed at the time that” the plaintiff’s car was manufactured, and denied Mitsubishi’s motion for summary judgment on the design defect claim.<sup>304</sup>

#### X. LITIGATION INVOLVING MANUFACTURER’S FAILURE TO PROVIDE WARNINGS

In *Cook v. Ford Motor Co.*, the plaintiffs sued the automobile manufacturer after their eight-year-old daughter sustained severe head trauma when she was struck in the head by an airbag in a rear-end collision.<sup>305</sup> The plaintiffs claimed that the manufacturer failed to warn of the danger that an active airbag presented for an unrestrained child in the front seat.<sup>306</sup> The plaintiffs testified that the airbag warning on page seventy-two of their owner’s manual did not clearly indicate the dangers posed to all children in the front seat.<sup>307</sup> The airbag warning stated that the airbag should be on “‘unless there is a rear-facing infant seat installed in the front seat’ and that turning the passenger airbag off ‘increases the likelihood of injury to forward facing occupants in the passenger seat.’”<sup>308</sup> The plaintiffs contended that the airbag warning did not provide adequate instructions for safe use and that the automobile manufacturers breached their duty to warn of the dangers associated with the car’s airbags.<sup>309</sup>

Judge Robb, who delivered the opinion in *Cook*, stated that the airbag warning in the owner’s manual instructed parents “to place children in the backseat ‘if possible,’ ‘suggested’ that children are safer there, and that occupants ‘should’ always wear seatbelts. Moreover, the warning fails to state that one of the risks from which children are possibly safer is injury from deployment of the front seat passenger airbag.”<sup>310</sup> Therefore, if the manufacturer’s warning had been adequate, the child would not have been injured because the plaintiffs would have placed the child in the backseat.<sup>311</sup>

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<sup>302</sup> *Id.*

<sup>303</sup> *Id.*

<sup>304</sup> *Id.* at 1157.

<sup>305</sup> *Cook v. Ford Motor Co.*, 913 N.E.2d 311, 315 (Ind. Ct. App. 2009).

<sup>306</sup> *Id.* at 317.

<sup>307</sup> *Id.* at 326.

<sup>308</sup> *Id.*

<sup>309</sup> *Id.*

<sup>310</sup> *Id.* at 328.

<sup>311</sup> *Id.* at 330.

In *Bresnahan v. Chrysler Corp.*, the plaintiff sustained injuries to her arm as the driver's airbag deployed following a rear-end collision.<sup>312</sup> The plaintiff brought a products liability action against the automobile manufacturer and asserted claims under the failure to warn theory and under the design defect theory pursuant to both the consumer expectations test and the risk-benefit test.<sup>313</sup> The plaintiff contended that the automobile manufacturer had failed to warn drivers not to sit too closely to the steering wheel because the airbag could cause serious injury if it deployed.<sup>314</sup> The plaintiff was sitting less than a foot away from the airbag cover of her Chrysler LeBaron when she rear-ended another car that was in front of her.<sup>315</sup>

"The impact triggered the LeBaron's airbag, which inflated as designed in milliseconds, emerging from the steering wheel at upwards of 100 miles per hour."<sup>316</sup> The airbag pushed the plaintiff's left arm upward and caused "her hand to strike the windshield and her elbow to impact the windshield pillar."<sup>317</sup> The "[p]laintiff's elbow was fractured in three places," and "[s]he also suffered abrasions of the neck, chin, and chest."<sup>318</sup> The plaintiff underwent repeated surgeries on her elbow for several months.<sup>319</sup> After a trial, the jury awarded the plaintiff \$49,650 in damages for the injuries that she suffered.<sup>320</sup>

The automobile manufacturer appealed the verdict in favor of the plaintiff.<sup>321</sup> Justice Fukuto delivered the opinion in *Bresnahan* and stated that "[t]he evidence disclosed that the airbag on plaintiff's car, like those on other cars, posed substantial risks of causing injuries, including the very injury plaintiff suffered, if the driver were seated close to the steering wheel."<sup>322</sup> Justice Fukuto further stated that "Chrysler was on notice of this danger, but plaintiff was unaware of it. The jury therefore could find that plaintiff's vehicle was defective, absent a warning to avoid driving close to the wheel, as plaintiff did."<sup>323</sup>

In *Chandler v. Gene Messer Ford, Inc.*, the plaintiffs filed a lawsuit against the car dealership and car manufacturer for injuries that their minor son sustained.<sup>324</sup> The plaintiffs claimed that the manufacturer did not adequately warn them of the danger of placing their child in the front

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<sup>312</sup> *Bresnahan v. Chrysler Corp.*, 65 Cal. App. 4th 1149, 1151 (Ct. App. 1998).

<sup>313</sup> *Id.* at 1152.

<sup>314</sup> *Id.*

<sup>315</sup> *Id.* at 1151.

<sup>316</sup> *Id.*

<sup>317</sup> *Id.*

<sup>318</sup> *Id.* at 1151-1152.

<sup>319</sup> *Id.* at 1152.

<sup>320</sup> *Id.* at 1151.

<sup>321</sup> *Id.*

<sup>322</sup> *Id.* at 1154.

<sup>323</sup> *Id.*

<sup>324</sup> *Chandler v. Gene Messer Ford, Inc.*, 81 S.W.3d 493, 497 (Tex. App. 2002).

passenger seat with an airbag.<sup>325</sup> The plaintiffs stated that when a driver in a Buick LeSabre turned left in front of their Ford Aspire, the plaintiffs “crashed into the side of the Buick, and the ... front seat airbags [of the plaintiffs’ Ford] deployed.”<sup>326</sup> The plaintiffs’ son, who was seven years old and weighed between sixty and sixty-five pounds, was riding in the front passenger seat and suffered a severe head injury from the airbag.<sup>327</sup>

The warning on the visor of the plaintiffs’ Ford stated that “[a]n inflating airbag can seriously injure small children,”<sup>328</sup> and the owner’s manual defined small children as “children who are four years old or younger and who weigh forty pounds or less.”<sup>329</sup> The plaintiff argued that, according to the manual, Ford’s warning about “small children” on the visor referred *only* to children four years of age or younger and weighing forty pounds or less.<sup>330</sup> Therefore, there could be a “question as to whether Ford’s warnings ... were adequate to inform ... [the plaintiffs] of” the dangers of the airbag to their seven year old son.<sup>331</sup>

#### XI. SOLUTIONS TO REDUCE AIRBAG INJURIES

Although many automobile manufacturers have failed to warn drivers and passengers of the risks posed by airbags, the National Highway Traffic Safety Administration has proposed solutions for drivers and passengers so that airbag injuries can be reduced. The most important precaution for a driver or passenger is to use a seatbelt, including the proper use of the shoulder strap, to avoid being too close to an inflating airbag cushion.<sup>332</sup> Children who are ages twelve and under should sit in the back seats, but if a child cannot sit in the back seat for some reason, a child should sit “with the [front] seat pushed all the way back and [with] his [or her] seatbelt properly positioned.”<sup>333</sup> Furthermore, adults should maintain at least ten inches between their chest and the vehicle’s airbag.<sup>334</sup>

Vehicle owners can request authorization from the National Highway Traffic Safety Administration to have their vehicles equipped with on-off switches that allow driver and passenger airbags to be activated and deactivated.<sup>335</sup> To qualify for an on-off switch, the vehicle owners must have their doctors explain that due to a medical condition, the airbag poses a special risk that outweighs the risk of hitting their head, neck, or chest in a

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<sup>325</sup> *Id.*

<sup>326</sup> *Id.*

<sup>327</sup> *Id.*

<sup>328</sup> *Id.* at 505.

<sup>329</sup> *Id.*

<sup>330</sup> *Id.*

<sup>331</sup> *Id.*

<sup>332</sup> Ferguson, Segui-Gomez, & Simons, *supra* note 58, at 37.

<sup>333</sup> *Id.* at 38.

<sup>334</sup> *Id.*

<sup>335</sup> Brain, *supra* note 91.

crash if the airbag is turned off.<sup>336</sup> Vehicle owners who must transport infants riding in rear-facing child safety seats in the front passenger seats and owners who must transport children ages one to twelve in the front passenger seats can also qualify for on-off switches for their vehicles.<sup>337</sup> Furthermore, drivers who cannot change their customary driving positions and keep ten inches between their chest and the steering wheel can receive authorization from the NHTSA for an on-off switch.<sup>338</sup>

## XII. REFORMS NEEDED TO IMPROVE AIRBAG SAFETY

The National Highway Traffic Safety Administration has proposed solutions to reduce airbag injuries and has enacted regulations to improve the airbag designs.<sup>339</sup> When automobile manufacturers resisted using airbags, the agency mandated that front airbags be installed.<sup>340</sup> Although manufacturers have continually tried to cut costs by using less expensive, less protective designs, the National Highway Traffic Safety Administration has enacted regulations to improve the airbags.<sup>341</sup>

The federal agency has tried to improve the safety standards of vehicles through regulations, but has sometimes been slow to identify safety defects and tentative to act, as well as reluctant to use its full legal powers against the automobile manufacturers.<sup>342</sup> The agency's job is to ensure the safety of automobiles, but the agency has sometimes not taken a leading role until after the safety issues have reached a crisis level.<sup>343</sup> According to a *New York Times* investigation, the National Highway Traffic Safety Administration has had a hard time standing up to the multi-billion dollar automobile industry.<sup>344</sup>

In 2000, Congress passed the Transportation Recall Enhancement, Accountability and Documentation Act ("TREAD Act") "to give the agency more leverage over the auto industry and better access to accident data."<sup>345</sup> The law required automakers to report to the agency any claims that they received that blamed vehicle defects for serious injuries or

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<sup>336</sup> *Id.*

<sup>337</sup> Ferguson, Segui-Gomez, & Simons, *supra* note 58, at 38.

<sup>338</sup> *Id.*

<sup>339</sup> ESSENTIAL GUIDE TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, *supra* note 161.

<sup>340</sup> Public Citizen & OMB Watch, *The Cost Is Too High: How Susan Dudley Threatens Public Protections* 3, 7-8 (Sept. 2006).

<sup>341</sup> *Id.* at 11-12.

<sup>342</sup> Stout, Ivory, & Ruiz, *supra* note 11.

<sup>343</sup> *Id.*

<sup>344</sup> *Id.*

<sup>345</sup> *Highway Safety Agency is Falling Short in Its Mission to Protect the Public*, *supra* note 12; Transportation Recall Enhancement, Accountability, and Documentation Act, 49 U.S.C. §§ 30101-30170 (2014) (hereinafter "TREAD Act").

deaths.<sup>346</sup> However, the National Highway Traffic Safety Administration has allowed automakers to conceal important information by not requiring the automakers to disclose the cause of the accident, and the “agency has been lax in following up those claims” of safety defects.<sup>347</sup> Furthermore, the NHTSA has not made full use of its legal powers in investigating automakers.<sup>348</sup> The agency has not invoked its legal authority to order a company to recall vehicles in the last thirty-five years.<sup>349</sup> David Friedman, the agency’s current administrator, admitted to Congress that “he did not realize that the agency could issue subpoenas.”<sup>350</sup>

According to former employees of the NHTSA, part of the agency’s problem in investigating safety defects has been its resources, or at least how those resources are allocated.<sup>351</sup> “The agency’s budget for safety defects investigation has hovered around 1 percent of its total budget for each of the last six years, even as funding for other divisions such as its ratings program, has gained a larger share” of the total budget.<sup>352</sup> “The \$10.6 million total budgeted for ... [2014] is less than the \$14.4 million total compensation package that G.M.’s chief executive ... [stood] to earn in 2014.”<sup>353</sup> After Congress passed the TREAD Act in 2000 that required the NHTSA to analyze accident data, the defects office added additional staff, and by 2001, the office had sixty-three employees.<sup>354</sup> However, by 2014, the defects office only had fifty-one employees because of retirements and attrition.<sup>355</sup>

Joan Claybrook, who served as administrator of the National Highway Traffic Safety Administration from 1977 to 1981, stated that the agency “needs more money, staff, legislative clout and transparency, and it needs to be more user-friendly so people can make complaints.”<sup>356</sup> When Claybrook led the agency, its total staff consisted of about 900 people, but by 2014, the staff was only about 600 people.<sup>357</sup> Furthermore, according to Claybrook, she operated the agency with about twice the \$134 million that the National Highway Traffic Safety Administration was allocated in 2014

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<sup>346</sup> *Highway Safety Agency is Falling Short in Its Mission to Protect the Public*, *supra* note 12.

<sup>347</sup> *Id.*

<sup>348</sup> *Id.*

<sup>349</sup> Stout, Ivory, & Ruiz, *supra* note 11.

<sup>350</sup> *Id.*

<sup>351</sup> *Id.*

<sup>352</sup> *Id.*

<sup>353</sup> *Id.*

<sup>354</sup> *Id.*

<sup>355</sup> *Id.*

<sup>356</sup> Alisa Priddle, *Time to Reform GM and NHTSA is Now*, *Safety Advocate Says*, Detroit Free Press, (Apr. 2, 2014 8:12 p.m.), <http://archive.freep.com/article/20140402/BUSINESS0101/304020161/General-Motors-GM-recall-Joan-Claybrook-NHTSA-Mary-Barra-auto>.

<sup>357</sup> *Id.*

“to research defects, set standards and police safety violations.”<sup>358</sup> Claybrook stated that the agency’s resources are “totally inadequate” and that “[t]he agency cannot afford to open an investigation into every complaint” of safety defects.<sup>359</sup>

### XIII. LEGISLATION TO MAKE AIRBAGS SAFER

Congress needs to take immediate action to ensure that the National Highway Traffic Safety Administration is not lax in enforcing safety standards for motor vehicles.<sup>360</sup> Joan Claybrook proposes that Congress pose “unlimited penalties on companies that fail to act when safety is in question.”<sup>361</sup> Claybrook also wants the National Highway Traffic Safety Administration “to be given authority to recommend criminal action” if automakers fail to recall dangerous vehicles.<sup>362</sup> Although many automobile manufacturers are using side airbags, the side airbags are still unregulated by the federal government.<sup>363</sup> The automobile manufacturers will “continue to cut corners to save costs” unless the federal government passes additional and stricter laws to regulate the industry.<sup>364</sup>

Although “every state has enacted some form of child passenger legislation,” the state laws do not adequately protect the child passengers.<sup>365</sup> Airbag injuries are generally reduced when children are properly restrained and are in the back seat.<sup>366</sup> However, most state laws only require children age seven and under to be restrained, and therefore, a substantial number of children (those over age seven) are completely unprotected by the laws.<sup>367</sup> Furthermore, although every state, except New Hampshire, has laws that require a driver and front seat passenger to wear seatbelts, only thirty-four of these states and the District of Columbia have laws that allow police officers to ticket a driver or passenger for not wearing a seatbelt in the front seat.<sup>368</sup> In addition, only fifteen of these states have laws that allow an officer, under certain circumstances, to ticket a passenger for not wearing a seatbelt in the back seat.<sup>369</sup>

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<sup>358</sup> *Id.*

<sup>359</sup> *Id.*

<sup>360</sup> *Highway Safety Agency Is Falling Short in Its Mission to Protect the Public*, *supra* note 12.

<sup>361</sup> Priddle, *supra* note 356.

<sup>362</sup> *Id.*

<sup>363</sup> Baron, *The ‘Smart’ Airbag Case*, *supra* note 9, at 41.

<sup>364</sup> *Id.* at 40.

<sup>365</sup> Mary Ann Chirba-Martin, *Avoiding the Avoidable: Why State Laws Need to Protect Kids from Airbags*, 7 *IND. HEALTH L. REV.* 1, 12 (2010).

<sup>366</sup> *Id.* at 10.

<sup>367</sup> *Id.* at 12.

<sup>368</sup> GHSA, *State Seatbelt Laws*, May 2015, [http://www.ghsa.org/html/stateinfo/laws/seatbelt\\_laws.html](http://www.ghsa.org/html/stateinfo/laws/seatbelt_laws.html).

<sup>369</sup> *Id.*

All states need to pass legislation that requires children through the age of twelve to be properly restrained in the back seat.<sup>370</sup> All states should also pass laws that make failure to wear a seatbelt a “sufficient ground to stop a car and write a ticket,” thereby allowing officers to ticket the driver and all passengers in the front and the back seats who are not wearing seatbelts.<sup>371</sup> Public information campaigns can bring greater attention to these laws that attempt to make airbag performance safer.<sup>372</sup> Furthermore, stricter state laws, in conjunction with media education and their enforcement, can help reduce the airbag injuries.<sup>373</sup> Statistics have shown that airbag injuries decrease when drivers and passengers wear seatbelts and when children are properly restrained in the back seat.<sup>374</sup>

#### XIV. SOLUTIONS FOR PROBLEMS RAISED BY AIRBAGS

Despite the controversy over airbags, manufacturers continue to design airbags to reduce the risk of injuries.<sup>375</sup> Manufacturers are required to install both driver and passenger airbags, and a majority of the automakers offer either standard or optional side airbags.<sup>376</sup> The development of airbags has focused on “internal airbags,” which are installed in the passenger compartments of vehicles, but recently, a few companies have attempted to design external airbags to reduce the impact to an entire vehicle from a collision.<sup>377</sup>

TRW Automotive (“TRW”), a global supplier of automotive systems, is designing external airbags, and the company hopes to be able to install the external airbags in cars before the end of the decade.<sup>378</sup> TRW has proposed using radar-based sensors or cameras that could detect an imminent collision with an incoming object or surface, and the sensors or cameras would signal the external airbags to deploy.<sup>379</sup> The airbags would deploy from the car’s side panels in twenty to thirty milliseconds.<sup>380</sup>

An external airbag could absorb the impact that is caused by a frontal collision of and could thereby “substantially protect passengers” in

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<sup>370</sup> Chirba-Martin, *supra* note 365, at 18.

<sup>371</sup> *Id.* at 13.

<sup>372</sup> *Id.* at 9.

<sup>373</sup> *Id.* at 13.

<sup>374</sup> *Id.* at 21.

<sup>375</sup> Patterson, *supra* note 152.

<sup>376</sup> *Id.*

<sup>377</sup> *External Airbag System for Vehicles*, U.S. PATENT, (Aug. 31, 2010), <http://www.google.com/patents/US778481>.

<sup>378</sup> Ellie Zolfagharifard, *External Airbags That Pop Up on the Side of Cars Within 30 Milliseconds Could Be Available Before the End of the Decade*, MAIL ONLINE, (Sep. 30, 2013, 10:15 a.m.), <http://www.dailymail.co.uk/sciencetech/article-2439132/External-airbags-pop-SIDE-cars-30-milliseconds-available-end-decade.html>.

<sup>379</sup> *Id.*

<sup>380</sup> *Id.*

the car.<sup>381</sup> The airbag would be installed in a space between a bumper and a vehicle body.<sup>382</sup> The external airbag may include a “bumper cover, a cushion provided behind the bumper cover, and an inflator for generating a gas pressure to deploy the cushion. . . .”<sup>383</sup> The airbag system may further include “a sensing unit for detecting an obstacle in front of the vehicle,” as well as a control unit that would receive a transmitted signal from the sensing unit when a collision is anticipated.<sup>384</sup> When the control unit receives the signal that a collision is anticipated, it operates the inflator before the collision occurs, and deploys the airbag cushion, thus moving the bumper cover forward.<sup>385</sup> This would all happen “just before the vehicle collides with an obstacle, thus absorbing and mitigating impact.”<sup>386</sup>

#### XV. CONCLUSION

The automobile manufacturers resisted the use of airbags until the government mandated that they be installed in all vehicles.<sup>387</sup> When the manufacturers installed the airbags, they used cheap and unsafe designs to cut costs.<sup>388</sup> As a result of these defective designs, consumers have been injured when the airbags failed to deploy, deployed at improper times, or deployed too forcefully.<sup>389</sup> The National Highway Traffic Safety Administration has passed regulations to establish safety standards for vehicles and to reduce the number of airbag-related injuries, but at times, the federal agency has been lax in enforcing its safety standards.<sup>390</sup>

Congress needs to pass laws that heavily penalize car manufacturers who sacrifice the safety of the passengers.<sup>391</sup> Furthermore, when drivers and passengers are injured by airbags, these individuals should receive both compensatory and punitive damages.<sup>392</sup> If car manufacturers are required to pay large amounts to individuals who are injured by the airbags, the manufacturers would be incentivized to ensure that they are installing the safest airbags available. Manufacturers may also be more interested in developing innovative solutions, such as external airbags, to guarantee the safety of the drivers and passengers.

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<sup>381</sup> *External Airbag System for Vehicles*, *supra* note 377.

<sup>382</sup> *Id.*

<sup>383</sup> *Id.*

<sup>384</sup> *Id.*

<sup>385</sup> *Id.*

<sup>386</sup> *Id.*

<sup>387</sup> CHAN, *supra* note 25, at 3.

<sup>388</sup> Lawrence R. Booth & Roger E. Booth, *supra* note 5.

<sup>389</sup> Baron, *The ‘Smart’ Airbag Case*, *supra* note 9, at 40.

<sup>390</sup> *Highway Safety Agency is Falling Short in Its Mission to Protect the Public*, *supra* note 12.

<sup>391</sup> *Id.*

<sup>392</sup> *Defective Airbags*, *supra* note 204.