

PRESENT: Lemons, C.J., Millette, Mims, McClanahan, and Powell, JJ., and Russell and Lacy, S.JJ.

HYUNDAI MOTOR COMPANY, LTD., ET AL.

v. Record No. 140216

OPINION BY  
JUSTICE ELIZABETH A. McCLANAHAN  
JANUARY 8, 2015

KEITH ALLEN DUNCAN, INDIVIDUALLY  
AND AS GUARDIAN AND CONSERVATOR  
FOR ZACHARY GAGE DUNCAN, ET AL.

FROM THE CIRCUIT COURT OF PULASKI COUNTY  
Colin R. Gibb, Judge

In this products liability action, Hyundai Motor Company, Ltd., and Hyundai Motor America, Inc. (Hyundai) appeal from a judgment entered on a jury verdict in favor of Keith Allen Duncan and Vanessa Duncan, Guardians and Conservators for Zachary Gage Duncan (Gage), and Keith Allen Duncan and Vanessa Duncan, Individually.<sup>1</sup> Hyundai contends the circuit court erred in admitting the opinion testimony of the Duncans' designated expert witness, who testified that the location of the side airbag sensor in the 2008 Hyundai Tiburon being driven by Gage when he sustained injuries in a single-vehicle accident rendered the Tiburon unreasonably dangerous. We agree and will reverse the judgment of the circuit court.

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<sup>1</sup> The jury was unable to reach a verdict when the case was first tried in 2012. After the case was retried in 2013, the jury returned a verdict for the Duncans in the amount of \$14,140,000.

## I. BACKGROUND

Gage sustained a serious closed-head injury while driving his 2008 Hyundai Tiburon when he lost control of the vehicle, causing the vehicle to leave the road, strike two snow banks and a large bale of hay, before ultimately colliding with a tree on the driver's side of the vehicle. Although the Tiburon was equipped with a side airbag system, the airbag did not deploy.

The Duncans brought an action against Hyundai, which manufactured and distributed the 2008 Tiburon being driven by Gage, and initially asserted claims for negligence, failure to warn, breach of implied warranty of merchantability, breach of implied warranty of fitness for a particular purpose, and breach of express warranties. At trial, the Duncans pursued only their claim for breach of implied warranty of merchantability in which they assert that the "Tiburon was defective, unreasonably dangerous, was not fit for the ordinary purpose for which it was intended, and did not pass without objection in the industry in which it was sold." Specifically, the Duncans contend that if the sensor for the side airbag system had been placed in a different location, the airbag would have deployed and prevented Gage's injury.

## II. Expert Testimony of Design Defect

To support their claim, the Duncans designated Geoffrey Mahon (Mahon), a mechanical engineer, as an expert in airbag design to testify that the 2008 Hyundai Tiburon was defectively designed. Mahon expressed the opinion that if Hyundai had located the sensor for the side airbag system on the B-pillar of the vehicle (the pillar where the front door closes), approximately 4 to 6 inches from the floor, instead of on the cross-member underneath the driver's seat, the side airbag would have deployed. Therefore, according to Mahon, the location of the side airbag sensor on the cross-member rendered the 2008 Tiburon unreasonably dangerous.

### A. Motion in Limine

Prior to trial, Hyundai moved to exclude Mahon's opinions as having an insufficient foundation because Mahon did not conduct any analysis to determine whether the side airbag would have deployed if the sensor had been located where Mahon proposed.

When deposed, Mahon testified that in reaching his opinion, he relied upon a computer-aided engineering study conducted by Hyundai in 1999 in which Hyundai analyzed 14 potential locations for the side airbag sensor, including a location on the B-pillar that was 10 to 12 inches from the

floor.<sup>2</sup> Mahon did not adopt any of the 14 locations analyzed by Hyundai for his placement of the side airbag sensor, but determined that a location on the B-pillar approximately 4 to 6 inches from the floor "would be [his] first choice." He further explained that since Hyundai did not analyze the location he proposed, he would "have to run tests to verify that that's just the right location, but based on [Hyundai's] evidence of the somewhat higher B-pillar location, that looks very promising."

While Mahon believed the best location for the sensor was at the B-pillar, he testified he did no testing to determine if the side airbag would have deployed in Gage's accident had the sensor been placed at any other location.

Q . . . Have you done any test or calculation to show that some other sensing system location if used in the Duncan Tiburon would have caused the side air bag to fire in this crash?

A I have not done any tests, I think as I indicated earlier, nor have I done any serious calculations. What I've done is look at the signal at the B-pillar and the signal at the location and concluded that I got a much more robust and timely signal at the B-pillar.

(Emphasis added.) The circuit court denied Hyundai's motion to exclude Mahon's testimony, and he was permitted

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<sup>2</sup> Based on the 1999 location study and subsequent crash testing, Hyundai decided to place the sensor on the cross-member underneath the driver's seat.

to express his opinions at trial, over Hyundai's objections.<sup>3</sup>

B. Trial Testimony

At trial, Mahon testified that Hyundai was not required under Federal Motor Vehicle Safety Standards (FMVSS) to install a side-impact airbag system in the 2008 Tiburon, and that the 2008 Tiburon would have complied with the FMVSS for side impact protection without any side airbag system.<sup>4</sup> Nevertheless, according to Mahon, if a manufacturer decides to put in an airbag system and "tell people there's a safety system in this car that's going to work a certain way and then it doesn't work? It's got to work. I mean, that's just improper."

Mahon's initial impression of the airbag system was that "the airbag should have gone off," but upon further investigation, he concluded that the system was acting as designed "so this indicates that it was designed improperly, because this is a crash where you really need an airbag." Mahon agreed that the 2008 Tiburon, with the side airbag system, complied with FMVSS 214, the standard specifically

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<sup>3</sup> The circuit court ruled on Hyundai's motion to exclude Mahon's opinion prior to the first trial and adopted its ruling prior to the second trial.

<sup>4</sup> As Mahon explained, the National Highway Traffic Safety Administration is responsible for regulating the safety performance of motor vehicles and has established the FMVSS as minimum standards with which all vehicles sold in the United States must comply.

related to side impact protection. He further acknowledged that the 2008 Tiburon "did reasonably well" when Hyundai conducted 22 crash tests in which it ran the vehicle into different types of barriers, at different speeds and angles, with the side airbag sensor located on the cross-member underneath the driver's seat.<sup>5</sup>

In Mahon's opinion, however, the side airbag would have deployed in Gage's accident if the sensor for the side airbag system had been located on the B-pillar, approximately 4 to 6 inches from the floor. According to Mahon, this was true even though the sensor on the cross-member underneath the driver's seat was closer to the point of impact than it would have been if the sensor had been located in the B-pillar because Hyundai's 1999 location study showed that there was a much better signal on the B-pillar.<sup>6</sup> In Mahon's view, therefore, the 2008 Tiburon was defectively designed and unreasonably

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<sup>5</sup> Mahon did not dispute that the side airbag system in the 2008 Tiburon performed as designed and offered good protection when deployed.

<sup>6</sup> According to Mahon, Hyundai's concerns with oscillations and other "noise" at outboard locations such as the B-pillar were unfounded because "we've been dealing with those noisy locations since the 1980s," and he discounted Hyundai's determination that the B-pillar location had poor responsive characteristics to door impact.

dangerous because the sensor for the side airbag system was not located on the B-pillar.

Consistent with his deposition testimony, Mahon testified at trial that he did not perform an analysis to determine whether the side airbag in the 2008 Tiburon would have deployed if the sensor was in a different location but relied upon the results of the location study undertaken by Hyundai in 1999. Mahon conceded that the location on the B-pillar considered by Hyundai was located 10 to 12 inches from the floor, and he had no data demonstrating the performance of a sensor located on the B-pillar 4 to 6 inches from the floor. He further agreed that because the airbag system must work quickly, that is the sensor system must decide within 15 milliseconds of a crash event whether an airbag is required and then inflate the airbag in 15 to 50 milliseconds, the location of the sensor is important to the overall crash sensing system such that inches, and even increments smaller than inches, matter in the determination of the location of the sensor.

Though Mahon testified that the vehicle's crash sensing system is "a combination of the structure of the vehicle, the sensors themselves, and then any algorithm . . . working together to make a decision whether or not this event is worthy of an airbag," he acknowledged that he had not performed any tests to determine whether any different sensor location,

structure, or mathematical algorithm would have caused the side airbag to deploy in Gage's crash.

Q Have you done any test or calculation to show that some other side sensor location if used in the Duncan Tiburon would have caused the side airbag to fire in this crash?

A Based on my industry experience, my analysis says yes. Have I done a calculation? No.

Q Have you done any test?

A Of course not.

Q . . . Have you done any test or calculation to show that some other structure, if used in the Duncan Tiburon, would have caused the side airbag to fire in this crash?

A. Haven't done it.

Q Have you done any test or calculation to show that some other algorithm, if used in the Duncan Tiburon, would have caused the side airbag to fire in this crash?

A Well, in fact I think it would. I haven't done that work.

(Emphasis added.) Relying instead on his "industry experience," Mahon testified that the data in Hyundai's location study "spoke to [him] . . . [a]s one skilled in the art."

### III. ANALYSIS

On appeal, Hyundai argues there was an insufficient foundation for Mahon's opinion that the location of the sensor



for the side airbag system rendered the 2008 Tiburon unreasonably dangerous.<sup>7</sup>

Expert opinion may be admitted to assist the fact finder if such opinion satisfies certain requirements, "including the requirement of an adequate factual foundation." Forbes v. Rapp, 269 Va. 374, 381, 611 S.E.2d 592, 596 (2005); see Va. Code §§ 8.01-401.1 and -401.3; Va. R. Evid. 2:702 and 2:703; Countryside Corp. v. Taylor, 263 Va. 549, 553, 561 S.E.2d 680, 682 (2002). Since we review the circuit court's evidentiary rulings using an abuse of discretion standard, we will reverse the circuit court's decision to admit evidence only upon a finding of abuse of that discretion. John Crane, Inc. v. Jones, 274 Va. 581, 590, 650 S.E.2d 851, 855 (2007). A circuit court, though, "has no discretion to admit clearly inadmissible evidence." Harman v. Honeywell Int'l, Inc., 288 Va. 84, 92, 758 S.E.2d 515, 520 (2014).

As we have stated, "[q]ualification of an expert witness does not insure admission of his every statement and opinion." Swiney v. Overby, 237 Va. 231, 233, 377 S.E.2d 372, 374 (1989). While Code § 8.01-401.1 allows an expert to express an opinion without initially disclosing the basis for the opinion, "[w]e

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<sup>7</sup> Our resolution of the case on this issue makes it unnecessary for us to address Hyundai's additional assignments of error.

have never, however, construed that section to permit the admission of expert testimony that lacks evidentiary support." Vasquez v. Mabini, 269 Va. 155, 159, 606 S.E.2d 809, 811 (2005). Expert opinion must be premised upon assumptions that have a sufficient factual basis and take into account all relevant variables.

"Expert testimony founded upon assumptions that have no basis in fact is not merely subject to refutation by cross-examination or by counter-experts; it is inadmissible. Failure of the trial court to strike such testimony upon a motion timely made is error subject to reversal on appeal. Furthermore, expert testimony is inadmissible if the expert fails to consider all the variables that bear upon the inferences to be deduced from the facts observed."

CNH America LLC v. Smith, 281 Va. 60, 67, 704 S.E.2d 372, 375 (2011) (quoting Vasquez, 269 Va. at 160, 606 S.E.2d at 811).

Mahon's opinion that the 2008 Tiburon was unreasonably dangerous was premised upon his assumption that the side airbag would have deployed if the sensor had been located on the vehicle's B-pillar. Yet, as Mahon readily conceded, he did not perform any analysis or calculations to support this assumption. In fact, Mahon admitted that the crash sensing system depends upon a combination of the structure of the vehicle, the sensors themselves, and any algorithm, but he did not perform any tests to determine whether a different sensor location, structure, or algorithm would have caused the side airbag to deploy in Gage's crash. Furthermore, despite his

testimony that inches, and even increments smaller than inches, matter when choosing the sensor location, his proposed location was more than four inches from any location studied by Hyundai.

In short, Mahon's opinion that the 2008 Tiburon was unreasonably dangerous was without sufficient evidentiary support because it was premised upon his assumption that the side airbag would have deployed if the sensor was at his proposed location - an assumption that clearly lacked a sufficient factual basis and disregarded the variables he acknowledged as bearing upon the sensor location determination. Although experts may extrapolate opinions from existing data, a circuit court should not admit expert opinion "which is connected to existing data only by the ipse dixit of the expert." General Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (decided under the version of Fed. R. Evid. 702 which the General Assembly adopted, verbatim, in current Code § 8.01-401.3(A)). Mahon's opinion that the vehicle was unreasonably dangerous was based on his ipse dixit assumption that the side airbag would have deployed in Gage's crash if the sensor had been located on the B-pillar. But the "analytical gap" between the data Mahon relied upon from Hyundai's location study and the opinion he proffered was "simply too great." Id. Therefore, Mahon's opinion was inadmissible, and the circuit court abused its discretion in admitting it.

The Duncans relied upon Mahon's opinion that the 2008 Tiburon was unreasonably dangerous to satisfy their burden of proving that Hyundai breached its implied warranty of merchantability.<sup>8</sup> As we have concluded, however, Mahon's opinion was premised upon his unfounded assumption that the side airbag would have deployed if the sensor had been located on the B-pillar of the vehicle instead of on the cross-member underneath the driver's seat.<sup>9</sup> Because Mahon's opinion supplied

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<sup>8</sup> The Duncans claim that Hyundai breached its implied warranty of merchantability alleging that the "Tiburon was defective, unreasonably dangerous, was not fit for the ordinary purpose for which it was intended, and did not pass without objection in the industry in which it was sold." See Code § 8.2-314(2) ("Goods to be merchantable must be at least such as (a) pass without objection in the trade" and "(c) are fit for the ordinary purpose for which such goods are used."). The Duncans were required to prove that the 2008 Tiburon was unreasonably dangerous for the use to which it would ordinarily be put or some other foreseeable purpose and that such condition existed when the vehicle left Hyundai's hands. Morgen Indus., Inc. v. Vaughan, 252 Va. 60, 65, 471 S.E.2d 489, 492 (1996); Logan v. Montgomery Ward & Co., 216 Va. 425, 428, 219 S.E.2d 685, 687 (1975); see Bayliner Marine Corp. v. Crow, 257 Va. 121, 128, 509 S.E.2d 499, 503 (1999) (party claiming breach of implied warranty of merchantability must prove failure to meet an established standard of merchantability in the trade); see also Turner v. Manning, Maxwell & Moore, Inc., 216 Va. 245, 251, 217 S.E.2d 863, 868 (1975) (evidence of industry custom "may be conclusive when there is no evidence to show that [the product] was not reasonably safe").

<sup>9</sup> Since we conclude that Mahon's opinion lacked an adequate foundation, it is unnecessary for us to address whether the addition of the side airbag system to the 2008 Tiburon could render the vehicle unmerchantable when the vehicle was indisputably merchantable without the system and the side airbag did not cause Gage's injuries.

the only support for the Duncans' claim that the vehicle was unreasonably dangerous, the inadmissibility of Mahon's opinion as a matter of law is fatal to the Duncans' claim and entitles Hyundai to judgment as a matter of law.

#### IV. CONCLUSION

For the foregoing reasons, we will reverse the judgment of the circuit court and enter final judgment for Hyundai.

Reversed and final judgment.

JUSTICE POWELL, dissenting.

I disagree with majority's conclusion that the opinion of Geoff Mahon, the plaintiff's expert, lacked an adequate foundation and should have been struck. In my opinion, the majority reaches this conclusion by improperly focusing on Mahon's preferred location for the side airbag sensor, even though it is clear that he did not base his conclusion on this preferred location. In so doing, the majority fails to view Mahon's testimony in the light most favorable to the Duncans, the prevailing party below. See Dagner v. Anderson, 274 Va. 678, 681, 651 S.E.2d 640, 641 (2007) (viewing the evidence in the light most favorable to the prevailing party below when reviewing whether the trial court erred in allowing expert testimony).

On direct examination Mahon clearly relied on the findings of Hyundai's 1999 location study and his calculations from the crash severity analysis to determine that the airbag would have deployed if the sensor was in the specific location<sup>1</sup> on the B-pillar that Hyundai tested in the 1999 location study (hereafter referred to as the "B-pillar Location"). According to Mahon, the 1999 location study indicated that the signal received by the cross member had "less amplitude" and was "later than at the more outboard location such as the sill and the B-pillar. Or even the door." Indeed, he goes on to specifically state that "Hyundai's own location study . . . show[s] that you get a much better signal on the B-pillar than you do on the cross member." Furthermore, the crash severity analysis indicated that the G-forces generated by the impact in this case were significantly higher than the threshold Hyundai established for triggering an airbag. Specifically, he calculated that the impact in the present case generated approximately 7.2 Gs, whereas Hyundai's own data indicated that it wanted an airbag to deploy at 5.1 Gs or above.

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<sup>1</sup> Notably, in the 1999 location study, Hyundai only tested a single B-pillar location.

Using the signal strength data contained in the 1999 location study, he extrapolated that the airbag did not deploy because the sensor did not receive a strong enough signal due to its location on the cross member. Specifically, he opined that the cross member was too far "inboard" and not rigid enough to receive the necessary signal. He went on to determine that, because the B-pillar was a more rigid structure, located in the crush zone, a sensor placed there would receive a stronger signal, resulting in airbag deployment. Thus, in Mahon's expert opinion, the B-pillar Location would have resulted in airbag deployment in the present case.<sup>2</sup>

The majority, however, never addresses any of this testimony by Mahon. Indeed, notwithstanding the fact that almost all of Mahon's testimony related to sensor placement in a specific location on the B-pillar, i.e., the location on the B-pillar subject to testing in the 1999 location study, the majority characterizes this testimony as disregarding "the variables . . . bearing upon the sensor location determination." Instead, the majority focuses on statements by

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<sup>2</sup> Notably, Mahon specifically testified that a properly designed airbag system for the 2008 Tiburon would have had the side impact sensor on the B-pillar and that a properly designed airbag system would have deployed an airbag in the present case.

Mahon relating to what he believed would be the ideal location for a side airbag sensor in the 2008 Tiburon. Specifically, the majority focuses on the testimony that Mahon believed that the ideal location for the airbag sensor would be on the B-pillar, approximately four to six inches from the floor (hereafter referred to as the "Proposed Location").

It is important to note, however, that there was no mention of the Proposed Location during Mahon's direct examination. Rather, it is on cross-examination that the idea of placing the sensor in the Proposed Location was first brought up at trial. Even then, the Proposed Location was only brought up after Hyundai's attorney confirmed that Mahon's prior testimony about the B-pillar Location was based on the 1999 location study.<sup>3</sup>

The majority also relies on Mahon's testimony where he "admits" that he had not done any tests or calculations showing that placing the sensor in another location would have resulted

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<sup>3</sup> Indeed, immediately prior to bringing up the alternative location, Hyundai's attorney specifically asked Mahon:

The data that you looked at and that you rely on for expressing your opinion about the B-pillar being a better location than underneath the driver's seat . . . is based on the sensor study work that was done with the B-pillar location there; right?



in the airbag deploying. In my opinion, however, this testimony is taken completely out of context. The testimony cited by the majority is clearly in reference to the Proposed Location, not the B-pillar Location studied by Hyundai. Indeed, it is particularly telling that the quoted exchange takes place immediately after the discussion of the Proposed Location. Thus, placed in the proper context, it is clear that Mahon was admitting that he had not performed any tests to determine whether the Proposed Location would have caused the side airbag to deploy in Gage's crash. Moreover, this "admission" is rebutted by Mahon's lengthy testimony about the calculations he performed as part of his crash severity analysis. With regard to the B-pillar Location, Mahon consistently maintained that, based on Hyundai's own study and his calculations in the crash severity analysis, a sensor placed on the B-pillar in the location tested by Hyundai in the 1999 location study would have deployed in this accident.

"Expert testimony is inadmissible if it is speculative or founded on assumptions that have an insufficient factual basis." John v. Im, 263 Va. 315, 320, 559 S.E.2d 694, 696 (2002). For that reason, I agree with the majority that Mahon's testimony about the Proposed Location was without sufficient foundation. However, the majority's opinion goes significantly beyond striking Mahon's testimony about the

Proposed Location. Rather, the majority implies that, because Mahon, in relying on his knowledge and experience, believes a better, untested alternative potentially exists, his opinion as a whole is invalid. The majority gives no indication how the foundation of Mahon's testimony relating to the B-pillar Location is undermined by Mahon's belief that the Proposed Location may be better than any of the tested locations.<sup>4</sup> Further, there is nothing in the record indicating that he based his testimony about the B-pillar Location on his belief that the Proposed Location may offer a better alternative to those tested in the 1999 Location Study. Nor is such a belief mutually exclusive with his testimony about the B-pillar Location. Accordingly, in my opinion, Mahon's opinion about the B-pillar Location had sufficient foundation and, therefore, the trial court did not err in allowing him to testify.

That said, I would still reverse the decision of the trial

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<sup>4</sup> I feel it is important to point out that, given the way in which the testimony about the Proposed Location was adduced at trial, the majority opinion could potentially lead to parties purposefully asking opposing experts about untested alternative theories that relate to the subject matter at issue and then using this testimony as a means of disqualifying those experts.

court. In my opinion, the trial court erred in refusing to give Hyundai's Proposed Jury Instruction 21.<sup>5</sup>

A litigant is entitled to jury instructions supporting his or her theory of the case if sufficient evidence is introduced to support that theory and if the instructions correctly state the law. When we review the content of jury instructions, our sole responsibility . . . is to see that the law has been clearly stated. Determining whether a proffered jury instruction accurately states relevant legal principles is a question of law reviewed de novo on appeal.

Smith v. Kim, 277 Va. 486, 491, 675 S.E.2d 193, 196 (2009)  
(citations and internal quotation marks omitted).

Hyundai's Proposed Jury Instruction 21 is an accurate statement of the law. Indeed, it does not inform the jury that Hyundai's compliance with the Federal Motor Vehicle Safety Standards ("FMVSS") was dispositive. Rather, it merely provides the jury with a guide for determining whether the

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<sup>5</sup> Hyundai's Proposed Jury Instruction 21 stated:

In determining what constitutes a defective product, you may consider, along with other evidence in the case, any pertinent safety standards issued by the government and any pertinent custom in the industry at the time the motor vehicle was manufactured. Such evidence may assist you in determining whether or not the motor vehicle in question was defective, but does not require that you find one way or the other as to that issue.

Tiburon was reasonably safe or unreasonably dangerous. Furthermore, as the United States Court of Appeals for the Fourth Circuit has recognized, evidence relating to a manufacturer's compliance with the FMVSS is "relevant and necessary" to demonstrate a company's care in bringing a product to market. S.L.M. v. Dorel Juvenile Group, Inc., 514 Fed. Appx. 389, 392 (4th Cir. 2013) (approving a similar instruction relating to a different FMVSS standard). Therefore, I would reverse the trial court's judgment based upon its refusal to give Hyundai's Proposed Jury Instruction 21 and remand the case for retrial.