CALIFORNIA ASSOCIATION
OF ACCIDENT RECONSTRUCTION SPECIALISTS

SKIDMARKS

DECEMBER 2014 – VOLUME 16, NUMBER 4

An airbag that can kill: Massive recalls

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THE BOARD BEAT

As 2014 comes to an end, CA2RS membership has grown to 369 members which is the highest total in the history of the organization! I have heard from you, the membership, that there are many reasons for this unprecedented membership total. You have shared with me that you believe the quality of the training, both at quarterly meetings and at the annual conference, is stronger than ever. That is important feedback. The Board of Directors believes offering quality training is our number one objective. We also believe there is no reason we can't all have some fun in the process of learning and networking.

Quite a few members have shared with me that they believe the updated website, which was launched a couple of years ago, has made the CA2RS organization stronger. I could not agree more. The website has made it much easier for the BOD to communicate with the membership. Open communication is also an important objective of the BOD.

Recently, I was honored to be elected to serve another two-year term as the Chairman of CA2RS. I appreciate your continued confidence in my leadership. However, please know that I do not lead the CA2RS organization by myself. During the past four years I have received tremendous support from the other members of the BOD. The organization is what it is today because of selfless teamwork of behalf of the entire BOD and the supporting staff. I believe the future of CA2RS looks bright.

In closing, I would like to personally thank Frank Owen for his years of service as the CA2RS newsletter editor. Frank tendered his resignation in part because he will be spending time consulting in Italy. Frank did a wonderful job bringing us the latest news in the world of Collision Investigation and Reconstruction. Frank was very thorough and passionate in his duties. He has assured me he will continue to be a contributing member of CA2RS in the future. We wish Frank continued success in his endeavors.

Please feel free to contact me at chris@chriskauderer.com should you have any questions or suggestions as to how the BOD can made CA2RS even better. Remember we are here to serve you the membership. It is your Organization

Happy Holidays and a prosperous New Year to all of you

Warm Regards,

Chris Kauderer
CAARS President

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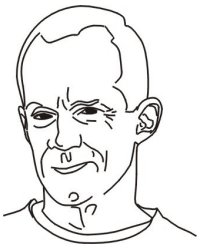
Letter from the editor

Dear CAARS members,

With this newsletter I bring to a close 2½ years of editing the CAARS newsletter. It has been a lot of work, but it has also been a lot of fun. When I started, I was new into accident reconstruction, though I had done several legal cases involving product design defects and I had taught Dynamics, the core course for accident reconstruction at the university level for years. Thus the newsletter was for me a great vehicle for increasing my own understanding of the practice of accident reconstruction. Now I have somewhat of a reputation at Cal Poly for posing problems on tests at Cal Poly involving texting students who ram into each other, killing each other and all their passengers.



This is a really interesting field in that it exists at the confluence of two disciplines—engineering and law enforcement. Engineers often work closed off from the rest of the world—in cubicles, in factories, in the halls of academia. I've worked in all three places, and one comes to work in a bubble and to see things just from a technical perspective. For me, one of the richest parts of the experience was to be able to rub elbows with policemen, former policemen, and other law-enforcement people. It also was gratifying to me that they were open to me and treated me as if I had something to offer to their science. The newsletter was, in a way, my concrete contribution to that science.

But I should not speak just in the past tense. I hope to continue to be involved in CAARS and a regular contributor to the newsletter. It seems like with every issue, I wind up with a list of things to put into the newsletter that there's just not room for. Now maybe I'll have some time to work through that list and to keep contributing. But for now, research work in Northern Italy has put a big claim on my time, and I have to back out a bit for the next 1½ years or so. Who knows also where that will lead…

But thanks to all who were helpful to me in making my job of getting the newsletter out easier. Special thanks to two CAARS members--Benn Karne and Louis Peck--who contributed their own personal AR stories to the newsletter in our occasional "Meet the member" column. It is still my opinion that one of the very good benefits the newsletter could bring to the membership would be the help us each get to know one another better. I understand that the editorship is in good hands from here too, so expect good coverage of the AR scene in California to continue with the March 2015 newsletter.

Best wishes,

Frank Owen

fowen@aoengr.com

Upcoming ACTAR Examination Dates and Locations

March 2015

12 March – Henderson/Las Vegas, NV, sponsor: SATAI. New applications must be received by 12 January. Exam registration cut-off date is 12 February. Held in conjunction with SATAI Spring Conference.

14 March – Salem, OR, sponsor: FARO. New applications must be received by 14 January. Exam registration cut-off date is 14 February. Held at Days Inn Black Bear Hotel, 1600 Motor Court NE.

19 March – Ontario, OR, sponsor: OSP. New applications must be received by 19 Janruary. Exam registration cut-off date is 19 February. Held at Oregon DOT, 1390 SE 1st Ave.

There are other tests offered in other parts of the country and Canada. Please go to ACTAR test website listed below for these dates. All test dates above subject to new testing regulations, which prohibit the use of electronic devices for testing. Go to www.actar.org/test.html for additional information.

CAARS ANNUAL CONFERENCE - SOUTH LAKE TAHOE, CALIFORNIA

Smorgasbord of topics at annual conference

By Frank Owen

The 2014 CAARS Annual Conference took place 23-25 October in South Lake Tahoe, California. This year's event drew over 80 participants. A variety of topics were presented:

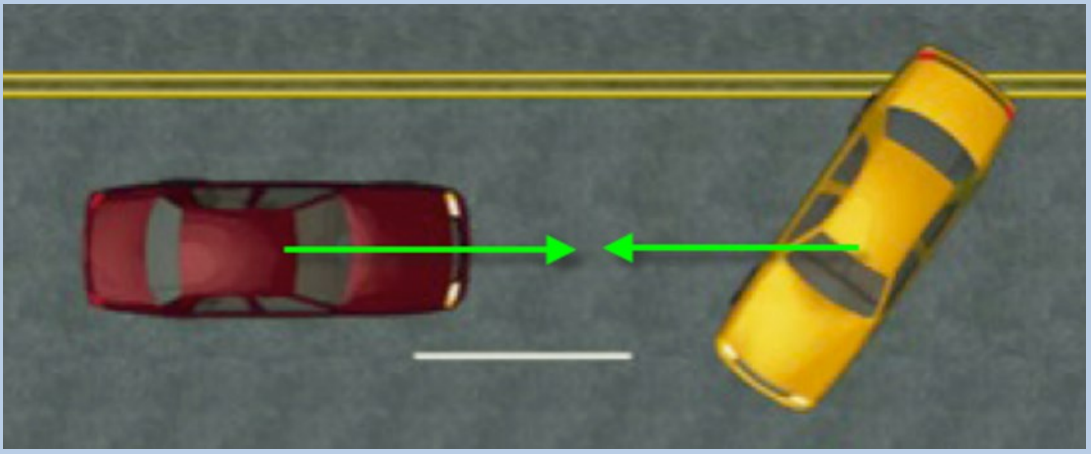
1. Momentum and energy methods in crash analysis with case studies in which CDR data was compared with analysis results to confirm the analysis
2. Accident reconstruction using the Monte Carlo Method to deal with uncertainties
3. Tire mark identification in accident reconstruction
4. Accident reconstruction using energy, stiffness, and crush to determine pre-impact speeds

These presentations were given by three members of the technical staff of Cooper Barrette Consulting of Lake Zurich, Illinois—Gary Cooper, Roger Barrette, and Adam Hyde. All three have taught courses in accident reconstruction at Northwestern University, one of the main centers for AR instruction in this country. What follows is a synopsis of each of the topics covered in the seminar.

"Using Airbag and Powertrain Control Module Data with Momentum and Energy Calculations", by Gary Cooper

Gary's presentation was a thorough exposition of this topic with 1217 PowerPoint slides. He started with the very basics of momentum analysis, describing first such concepts as vectors, momentum, delta-v, principle direction of force, etc. After laying the fundamental groundwork, Gary's presentation turned to focus more on momentum in a crash, showing how to apply the concepts for which he'd laid the groundwork. The deformation and restitution phases were explained.

The discussion progressed into more detailed territory with an explanation of different types of collision. The first considered were collinear collisions, where the directions of the two crashing vehicles do not differ by more than a 10° angle. The mechanics of these types of collisions were described in detail along with the trigonometry and algebra involved in making calculations to analyze such collisions. PDOF and delta-v were discussed in detail. All of this was done using small examples to illustrate each point.



In a collision, it is the directions of the velocities that matter, not the heading of the vehicles. Above is shown a collinear collision. The yellow vehicle is side-slipping, but the vehicle's velocities are collinear.

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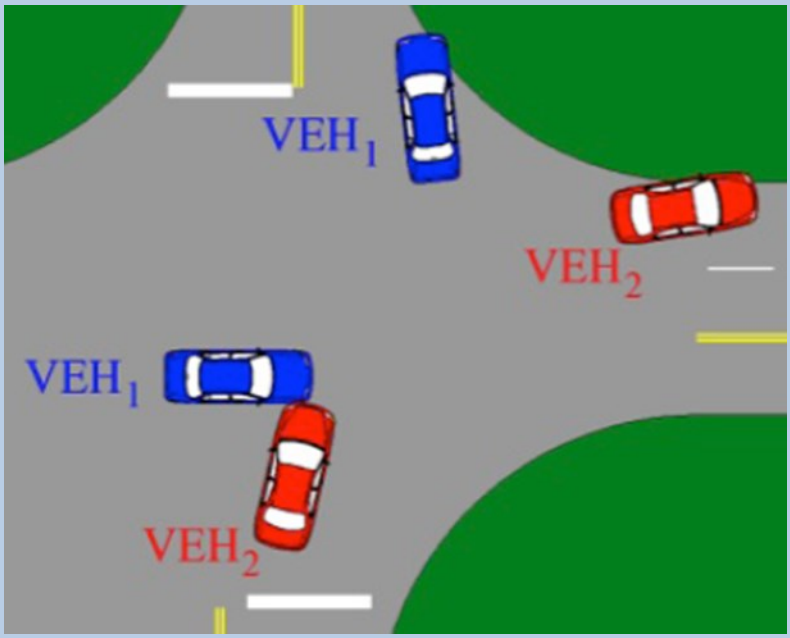
All of the above was still just laying the groundwork for detailed crash analysis of real collisions. The first case study was a collision between a Buick LaCrosse and a Chrysler PT Cruiser. Calculations using the techniques were illustrated. Also, the CDR data was given during the pertinent parts of the calculations to show how it matched up with the values calculated.

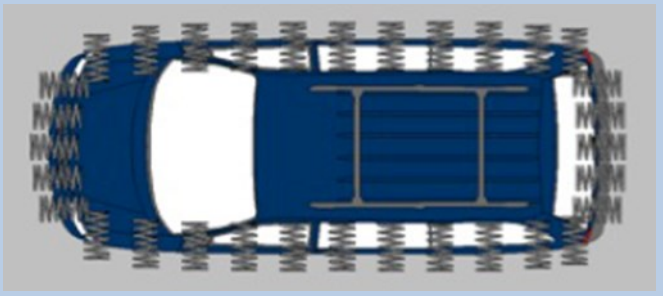


Oblique collision – impact and final rest positions

The second type of collision considered were oblique collisions. Here the velocity vectors are not collinear. Here vectors play a more important role, so the rules of vector algebra were discussed in detail. So were approach angles and departure angles. Post impact vehicle rotation was also touched on. Momentum was explained and how it works in two dimensions. A procedure for drawing a momentum diagram was given. (Ed. note: As I pointed out in a previous newsletter, this topic is covered very well in a paper I wrote on it, which is available at http://www.aoengr.com/AccidentReconstruction/MomentumDiagram.pdf.) Gary talked about yawing, the effect of locked wheels vs. wheels that were free to rotation, and how one calculates an effective drag factor for a yawing vehicle with some tires locked and some free to roll.

The discussion was accompanied at all points by numerical examples. The graphical solution (momentum diagram referred to above) was covered for a specific case. The momentum diagram yields the PDOF, delta-v, etc. After explaining the graphical approach, Gary covered the analytical approach to a momentum analysis—i.e., using equations to get a solution.

The presentation then turned to getting velocity estimates from damage, i.e. crush analysis. This was also covered very thoroughly with short examples mixed in with theoretical explanations to illustrate the points being made. The barrier equivalent velocity was explained. The concept of structural stiffness was covered in great detail. Gary covered a case study of an actual collision between a Chevrolet Camaro and a Plymouth Horizon.



In crush analysis a vehicle's structure is thought of as a bunch of collapsible springs that do not spring back into their original shapes after the collision.

A second case study, a crash between a Chevrolet Cavalier and a Ford Explorer, was analyzed in detail. As part of this the use of two computer programs, EDCRASH and EDSMAC, was explained. Additionally with this example, the CDR data was brought in to compare with the analytical results. Yet another example involving an SUV and a van was presented. Site measurements were part of this discussion. Again, ana-

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lytical results from EDCRASH AND EDSMAC were given. The CDR data was presented for this case too. Yet another case study involved a police cruiser that collided with a Harley Davidson, killing the rider.

Thus, Gary's all-day presentation was very thorough and covered much of the fundamental material needed for momentum analysis and crush analysis. Luckily Gary is quite an entertaining speaker, so he held the attendees' attention well. This seemingly long explanation of the topics presented is actually quite short, considering that Gary had 1217 slides in his presentation.

The second day of the conference was devoted to two topics:

1. the Monte Carlo method in accident reconstruction
2. tire mark identification

"The Monte Carlo method in accident reconstruction", by Roger Barratte

I really enjoyed the presentation on the Monte Carlo method, because I have seen references to this in the AR literature but never have taken the time to look further to understand the method. This method is a way to deal with uncertainty in any type of analysis. It gets its name from the gambling casino in Monte Carlo on the French Riviera, where one of its originators was a regular player. Roger Barratte of Cooper Barratte Consulting explained the method.

A further discussion of the method can be found in the Technical Corner on page 20 of this newsletter.

Besides the technical methodology of the Monte Carlo method, another issue that arises often when it is used is a challenge to it based upon whether it is accepted, whether its scientific acceptability meets the Daubert standard. In short, Roger explained that it does and that it has successfully beat this challenge in numerous cases. He gave references to technical publications that cover the method and illustrate that it is generally accepted as valid in the scientific community. He also cited specific challenges to it and showed specifically how it had beat back those challenges.

Roger made a couple of observations regarding features of accident reconstruction in general. From my notes:

Accident reconstruction methodology is 1) Investigate, 2) Reconstruct, 3) Simulate

This is interesting to me because it is precisely the same methodology we use in analyzing dynamic systems in engineering, whether they be electric motors, tanks of fluids, hydraulic actuators.

When Roger is asked in court if something "is possible", he replies: "I'm here to testify not to what is possible but rather to what is probable to a reasonable degree of engineering certainty."

"Crash Scene Investigation" by Roger Barrette, presented by Adam Hyde

I missed the tire mark identification presentation that was given early Friday afternoon. The weather in South Lake Tahoe was unbelievably nice, so I took my unicycle and rode around in the woods on the south shore of the lake. This presentation was put together by Roger Barrette but delivered by Adam Hyde, also of Cooper Barrette. From the PowerPoint slides, a great deal of attention was given to documenting the accident scene—how this is done, what instruments are available to do it.

A couple of tips when marking a crash scene: 1. have no opinions and mark everything, 2. Photograph the scene prior to marking and photographing it. Besides skid marks, gouges and scrape-marks were also discussed. For all of this, many examples were shown to illustrate the points being made. Many different types of skid marks where shown with expla-

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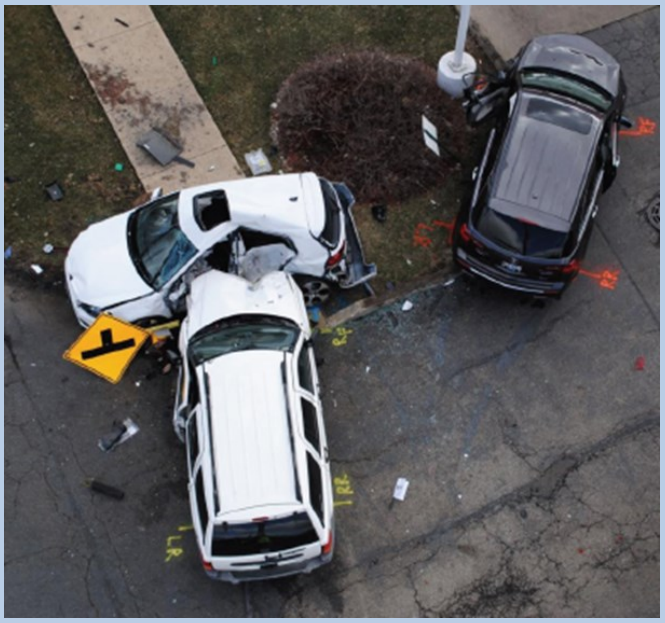
nations of how each type was caused—impact with an animal or a pedestrian, marks made during yawing, as examples.

"Force Balance Method with CDR Application Case Studies" by Adam Hyde

Adam Hyde of Cooper Barrette presented the force-balance method for AR on Saturday morning of the conference. This method of accident reconstruction analysis relies heavily on accounting for the energy lost in a collision. A vehicle can skid on different surfaces, encounter and bounce off objects, and yaw, in each phase shedding a bit of energy. Adam went into some details and illustrated with examples various scenarios, some complicated, of energy dissipation in a collision. The force-balance method is useful if some evidence is missing after a collision. One of the vehicles could have been removed, for example. Thus the damage for one vehicle may be well documented but not the corresponding damage on the second vehicle. The method utilizes Newton's Third Law, which states that between two bodies that collide, equal and opposite forces develop. Thus if we can determine the force that caused the damage on one vehicle, we know what force acted on the other vehicle.



In the wrong place at the wrong time. The nice lady who owned the white SUV with the sun roof was opening the door to her vehicle when the bullet vehicle, driven by an under-the-influence nitwit fatally crushed her and her vehicle.

A good deal of the discussion here on crush damage and how to measure it overlapped with Gary Cooper's discussion from two days before. Adam's presentation was very thorough and replete with case studies.

Besides these formal training presentations, CAARS members Bill Focha and Louis Peck gave a short description of a paper they had recently presented in Germany that covered drag factors for motorcycles after they had been laid over on their sides in crashes.

This year's conference was quite broad-based with many enriching examples from the fundamentals of momentum and crush-energy analysis.

On Saturday morning of the conference the annual CAARS business meeting was held. There was some discussion about whether or not the minutes from CAARS meetings were or should be posted on the Internet. Also discussed was announcements for training are sent to members. If AR training is offered with a discount to CAARS members, three announcements can be sent to the membership prior to the training.

WREX 2016 was discussed. This is a big event, and CAARS is a sponsor. The last such event was held at Texas A&M in 2000. There is a discount for CAARS members. You can sign up to be kept current on this conference at www.wrex2016.com.

Training was discussed. On tap are:

Q1 – Low-speed collision analysis using CDR and IIHS data
Q2 – Tom Braun of Boster, Kobayashi and Associates, Livermore
Q3 – J2 Engineering – Jim Flynn, Steve Harper, using HVE for accident reconstruction

CAR AND DRIVER

Massive Takata Airbag Recall: Everything You Need to Know, Including Full List of Affected Vehicles

December 2, 2014, by Clifford Atiyeh

The automotive world and beyond is buzzing about the massive airbag recall covering many millions of vehicles in the U.S. from nearly two dozen brands. Here's what you need to know about the problem; which vehicles may have the defective, shrapnel-shooting inflator parts from Japanese supplier Takata; and what to do if your vehicle is one of them.

The issue involves defective inflator and propellant devices that may deploy improperly in the event of a crash, shooting metal fragments into vehicle occupants. Nearly 11 million vehicles are potentially affected in the United States.

Initially, only six makes were involved when Takata announced the fault in April 2013, but a Toyota recall in June this year—along with new admissions from Takata that it had little clue as to which cars used its defective inflators, or even what the root cause was—prompted more automakers to issue identical recalls. In July, NHTSA forced additional regional recalls in high-humidity areas including Florida, Hawaii, and the U.S. Virgin Islands to gather removed parts and send them to Takata for review.

Another major recall issued on October 20 expanded the affected vehicles across several brands. For its part, Toyota said it would begin to replace defective passenger-side inflators starting October 25; if parts are unavailable, however, it has advised its dealers to disable the airbags and affix "Do Not Sit Here" messages to the dashboard.

While Toyota says there have been no related injuries or deaths involving its vehicles, a New York Times report in September found a total of at least 139 reported injuries across all automakers. In particular, there have been at least two deaths and 30 injuries in Honda vehicles. According to the Times, Honda and Takata allegedly have known about the faulty inflators since 2004 but failed to notify NHTSA in previous recall filings (which began in 2008) that the affected airbags had actually ruptured or were linked to injuries and deaths.

Takata first said that propellant chemicals were mishandled and improperly stored during assembly, which supposedly caused the metal airbag inflators to burst open due to excessive pressure inside. In July, the company blamed humid weather and spurred additional recalls.

According to documents reviewed by Reuters, Takata says that rust, bad welds, and even chewing gum dropped into at least one inflator are also at fault. The same documents show that in 2002, Takata's plant in Mexico allowed a defect rate that was "six to eight times above" acceptable limits, or roughly 60 to 80 defective parts for every 1 million airbag inflators shipped. The company's study has yet to reach a final conclusion and report the findings to NHTSA.

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CAARS first-quarter training

"Low-speed impact analysis using IIHS and CDR data", presented by Mark Whelchel.

Southern California: Monday, 26 January, Glendora Police Department, 150 S. Glendora Avenue, Glendora, CA 91741

Northern California: Thursday, 5 February, JFK Library, 555 Santa Clara St., Vallejo, CA 94590

UPDATE 11/7, 9:44 a.m.: The New York Times has published a report suggesting that Takata knew about the airbag issues in 2004, conducting secret tests off work hours to verify the problem. The results confirmed major issues with the inflators, and engineers quickly began researching a solution. But instead of notifying federal safety regulators and moving forward with fixes, Takata executives ordered its engineers to destroy the data and dispose of the physical evidence. This occurred a full four years before Takata publicly acknowledged the problem.

UPDATE 11/7, 5:29 p.m.: Two U.S. Senators have now called for the Department of Justice to open a criminal investigation on this matter. Takata has stated that "the allegations contained in the [New York Times] article are fundamentally inaccurate." The company went on to state that it "takes very seriously the accusations made in this article and we are cooperating and participating fully with the government investigation now underway."

UPDATE 11/13, 11:10 a.m.: Takata has released a more formal statement saying that the allegations made in last week's New York Times article "are fundamentally inaccurate" and that it "unfairly impugned the integrity of Takata and its employees." The company says (in this PDF) that there were no tests of "scrapyard airbag inflators" in 2004, that after-hours tests in 2004 "were not 'secret tests' . . . [but] were done at the request of NHTSA to address a cushion-tearing issue unrelated to inflator rupturing," and that it "did not suppress any test results showing cracking or rupturing in the inflators," whether to automakers such as Honda or to NHTSA.

Shrapnel from Takata airbag.

For its story about Takata's statement, the Times spoke again with one of its two sources for the November 6 article. That anonymous person is quoted as saying: "What Takata says is not true . . . They are trying to switch things around."

On November 12, we reported about a change in Takata's chemical makeup of its airbag propellant, which the company says is unrelated to the ongoing recall situation.

UPDATE 11/18, 6:10 p.m.: In light of a recent airbag failure in a 2007 Ford Mustang in North Carolina—which was not part of the original "high-humidity areas" Takata recall—the U.S. National Highway Traffic Safety Administration is calling for a nationwide recall of cars equipped with the defective Takata driver's-side airbags.

UPDATE 11/20, 5:35 p.m.: Automakers, officials from Takata, and motorists injured by defective airbags met for a hearing with Congress. NHTSA was accused of not responding quickly enough to the Takata airbag situation, and automakers also took heat for being slow with fixes. As of now, the recalls remain regional, but it seems only a matter of time before they're blanketed nationwide.

UPDATE 11/26, 1:00 p.m.: The U.S. National Highway Traffic Safety Administration has formally demanded that Takata push through a nationwide recall of cars equipped with the suspect driver's-side airbags. Also, officials in Japan are calling for a recall expansion, after an airbag from an unspecified car not covered by previous recalls ruptured in testing.

UPDATE 12/2, 5:45 p.m.: Toyota and Honda have released similar statements urging for an "industry-wide joint initiative to independently test Takata airbag inflators." Meanwhile, Takata's chairman stated today that he'll create a "quality assurance panel" to scrutinize the company's production procedures. Takata and NHTSA officials today made statements before the U.S. House of Representatives subcommittee on Commerce, Manufacturing, and Trade. NHTSA is still pushing for a nationwide expansion of the still-regional airbag recall—but for defective driver's-side airbags only; the agency says

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a coast-to-coast recall on passenger-side airbags isn't necessary. Such a large-scale recall, many say, would squeeze the limited supply of replacement parts in the most at-risk (read: humid) regions of the country.

UPDATE 12/3, 6:50 p.m.: Takata executives, as well as those from NHTSA and several automakers, again sat before Congress, discussing how this nightmare situation went unaddressed for so long, how it can be fixed promptly and properly, and how it will be prevented from happening again. Honda is expanding its recall nationwide, and Takata's internal testing has revealed high failure rates.

UPDATE 12/4, 10:25 a.m.: Chrysler, Ford, and Toyota have expanded their recalls of vehicles equipped with Takata airbags.

Chrysler's recall update adds the passenger-side airbags of roughly 149,000 2003 Ram pickups (1500, 2500, and 3500), which were already part of a driver's-side airbag recall. The recall remains regional, encompassing trucks "sold or ever registered in Alabama, Florida, Georgia, Hawaii, Louisiana, Mississippi, Texas and the U.S. territories of American Samoa, Guam, Puerto Rico, Saipan, and the Virgin Islands." Chrysler says it is unaware of any accidents or injuries related to these airbag inflators and that no failures have occurred in laboratory tests. NHTSA has already stated is dissatisfaction with Chrysler's move: "Chrysler's latest recall is insufficient, doesn't meet our demands, and fails to include all inflators covered by Takata's defect information report."

Ford's expanded recall is very similar to Chrysler's, adding passenger-side airbags to the repair list of about 13,000 vehicles (2004–2005 Rangers and 2005–2006 GTs) already involved in the regional Takata recalls. Ford is even more selective with the targeted locations: it covers vehicles "originally sold, or ever registered, in Florida, Hawaii, Puerto Rico, and the U.S. Virgin Islands. It adds certain zip codes with high absolute humidity conditions in Georgia, Alabama, Mississippi, Louisiana, Texas, Guam, Saipan, and American Samoa."

Toyota has recalled some 190,000 vehicles in China and Japan, many of them similar to the company's U.S.-market vehicles listed below.

UPDATE 12/5, 3:15 p.m.: Honda has announced the addition of 3 million vehicles to its list of affected cars—and also that its recall is now nationwide.

AFFECTED VEHICLES (total number if known in parentheses):

Acura: 2002–2003 TL; 2002 CL; 2003–2006 MDX

BMW (627,615): 2000–2005 3-series sedan and wagon; 2000–2006 3-series coupe and convertible; 2001–2006 M3 coupe and convertible

Chrysler (371,309, including Dodge): 2005–2008 Chrysler 300; 2007–2008 Aspen

Dodge/Ram (371,309, including Chrysler): 2003–2008 Dodge Ram 1500; 2005–2008 Ram 2500, Dakota, and Durango; 2006–2008 Ram 3500 and 4500; 2008 Ram 5500

Ford (98,000, est): 2004 Ranger; 2005–2006 GT; 2005–2007 Mustang

Honda (approximately 5.4 million, including Acura): 2001–2007 Accord (four-cylinder); 2001–2002 Accord (V-6); 2001–2005 Civic; 2002–2006 CR-V; 2002–2004 Odyssey; 2003–2011 Element; 2003–2007 Pilot; 2006 Ridgeline

Infiniti: 2001–2004 Infiniti I30/I35; 2002–2003 Infiniti QX4; 2003–2005 Infiniti FX35/FX45; 2006 Infiniti M35/M45

Lexus: 2002–2005 SC430

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Mazda (64,872): 2003–2007 Mazda 6; 2006–2007 Mazdaspeed 6; 2004–2008 Mazda RX-8; 2004–2005 MPV; 2004 B-series

Mitsubishi (11,985): 2004–2005 Lancer; 2006–2007 Raider

Nissan (717,364, including Infiniti): 2001–2003 Maxima; 2001–2004 Pathfinder; 2002–2006 Nissan Sentra

Pontiac: 2003–2005 Vibe

Saab: 2005 9-2X

Subaru (17,516): 2003–2005 Baja, Legacy, Outback; 2004–2005 Impreza, Impreza WRX, Impreza WRX STI

Toyota (877,000, including Lexus and Pontiac Vibe): 2002–2005 Toyota Corolla and Sequoia; 2003–2005 Matrix, Tundra

USA TODAY

Family-run Takata at center of air bag recalls

Kirk Spitzer, December 6, 2014

TOKYO – When the late Juichiro "Jim" Takada was building his family business into one of the world's largest suppliers of auto-safety equipment, he often was seen on factory floors -- at home and abroad – with sleeves rolled up, hard-hat on, personally involved.

Takata Corp. could use the same hands-on approach now as it struggles with one of the worst safety recall crises in decades.

More than 16 million cars have been recalled worldwide due to defective air bags made by Takata. Five deaths have been linked so far to defective air bag inflators that can explode with too much force, shooting metal and plastic shrapnel at the vehicle occupants. More than 130 others have been injured.

Reports of exploding air bags first surfaced in the mid-2000s. Honda announced the first U.S. recall for faulty Takata bags in a nationwide action in 2008.

Honda is Takata's biggest U.S. customer; about 5 million of the 8 million U.S. vehicles being recalled are Honda products.

The headquarters of Takata's U.S. subsidiary in Auburn Hills, MI. (Photo: Carlos Osorio, AP)

Tokyo-based Takata declined to meet a deadline Tuesday set by U.S. regulators to expand into a nationwide recall the ongoing regional recalls of the suspect air bag inflators by 10 of its automaker customers.The current recalls are limited to regions where high humidity is thought to increase the chances of degradation of the propellant used in the inflators.

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Honda told a House of Representatives subcommittee Wednesday that -- prompted by Takata's refusal -- it would expand its own regional recall of possibly defective Takata driver-side bags to a nationwide recall.

The National Highway Traffic Safety Administration said it would continue to pursue the process to force a national recall by Takata.

Takata is finding increasing trouble at home, as well, over the air bags.

No deaths or injuries have been reported in Japan, but a handful of inflator explosions since 2011 have led to a recall of 2.6 million vehicles there.

Japan's powerful Transport Ministry is considering whether to expand that recall and last week established a task force to meet daily with Takata officials to monitor progress. Transport Minister Akihiro Ohta warned that the crisis could damage the reputation of the country's entire auto industry.

Takata global quality chief Hiroshi Shimizu testifies at a Senate committee hearing last month into the air bag recalls.(Photo: Alex Wong, Getty Images)

"We need to solve it as soon as possible," he said. "The good reputation Japanese makers have enjoyed could be shaken."

Investors already have spoken. Takata's share prices have fallen almost 60% this year, and the company has been forced to set aside some 47 billion yen ($394 million) to cover recall costs so far -- a bill that is likely to climb far higher.

Through it all, Takata's third-generation chairman and chief executive has remained all but invisible.

Shigehisa Takada, 48, spoke at a shareholder's meeting in June, but has not made a public appearance since. The company's chief financial officer appeared at Tokyo's stock exchange last month to issue an apology, and filled in for Takada at a scheduled meeting with market analysts the following week.

That's a sharp contrast to General Motors CEO Mary Barra, who has been front-and-center during GM's recall of millions of vehicles this year for faulty ignition switches now linked to 36 deaths. She has fired 13 people, appeared several times on Capitol Hill, set up an indpendently administered victims' compensation fund and is using the issue to overhaul GM bureaucracy and speed action on other safety issues.

Takada has avoided Washington. The company's global quality assurance chief, Hiroshi Shimizu, testified at a Senate hearing into the crisis last month – where the company's performance was sharply criticized – and represented the company again on Wednesday at a U.S. House committee hearing, where he said the company is working to increase production of air bag replacement kits.

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That's a bad call, says Nicholas Benes, a corporate governance specialist in Japan.

"As the president of the company, not appearing before Congress does not look good. It behooves the company to get the most senior guy out there, telling what the company knows, doesn't know, and what the strategy is, and responding to the critics as openly and honestly as possible. They (Takata) haven't done that," said Benes, representative director for the Board Training Institute of Japan, a non-profit, public interest organization.

Takata was founded in 1933 as a textile manufacturer. It branched out into safety belts and other auto products in the 1950s and by the late 1980s it had become Japan's largest manufacturer of auto-safety products. It is one of three major manufacturers of air bags worldwide and has a global market share of about 20%.

The company went public in 2006 and now operates 56 plants in 20 countries, with more than 46,000 employees worldwide. Annual revenue last year reached 557 billion yen ($4.66 billion).

But for all that, the company remains tightly controlled by the Takada family, and its inner workings remain something of a mystery.

"It is completely controlled by the Takada family so outsiders don't really know what's going on there," says Koji Endo, managing director of Advanced Research Japan, a Tokyo-based independent equity research firm.

Shigehisa Takada, 48, joined the company after graduating from college in Japan and became chairman in 2007 following the retirement of his father, Juichiro, who died in 2011.

His mother, Akiko Takada, is retired from the company but retains the title of senior corporate advisor and reportedly remains active in company affairs. She also is president of the Takata Foundation, a not-for-profit organization that funds auto-safety research.

The company has announced plans to boost production of replacement kits for defective air bags from 300,000 per month to 450,000 to supply parts for the recalls, but otherwise has said little about how it plans to respond.

Says Endo, "Regrettably, the Takada family have not really been that helpful in terms of disclosure. So we don't know how they are looking at the problem."

OPINION

THE CHICAGO TRIBUNE

Air bag anxiety; Will your car kill you?

by The Chicago Tribune editorial board, 26 November 2014

Air bags shouldn't maim you. It's as simple as that, Takata.

Wait … the air bags we count on to protect us could malfunction because of humidity?

The air bag is a product you want to buy and never see. You don't want to think about it. You just want to know it's there to protect you when you drive.

You shouldn't be worried about defects, confused about recalls, or mistrustful of a manufacturer's evasive testimony

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before Congress.

In other words, never in a lifetime of driving should you have to wonder if an air bag might kill or maim you.

Yet out here on America's roads we're far too curious and concerned about which company made our vehicle's air bags and whether they require replacement. All because of the irresponsible actions of Takata Corp., a major supplier.

At least five deaths and dozens of injuries — perhaps 160 or more — have been blamed on faulty Takata air bags that exploded when activated, shooting metal shrapnel into the passenger compartment. Many of the vehicles involved are older models, but claims keep coming: When Brandi Owens of Georgia had a fender bender in her 2013 Chevrolet Cruze, the Takata driver-side air bag deployed with such force it detached from the steering wheel and struck her in the face, blinding her left eye, according to a lawsuit.

Do you need to worry about the safety of the air bags in your vehicle? Incredibly, the question isn't easy to answer, months after the scope of Takata's troubles emerged.

On Wednesday, the National Highway Traffic Safety Administration demanded a nationwide recall for millions of driver's side air bags, with the threat of heavy fines if Takata doesn't comply. The company had no immediate comment on the NHTSA demand. In recent weeks, Takata has resisted pressure for a broad recall, insisting that replacing air bags in a few areas of the country with persistently high humidity should be enough.

Wait … the air bags we count on to protect us could malfunction because of humidity? That's what Takata says.

Air bags, available since the 1980s and now mandatory, save thousands of lives. They deploy in the milliseconds after sensors detect the impact of a collision through a controlled explosive charge that inflates the bag. Takata, a major producer, has had serious trouble with different aspects of its manufacturing process and faced numerous recalls since 2008. But it hasn't adequately explained what's gone wrong in its factories or why it should be trusted now.

Under grilling at a Senate hearing in which his product was called a "ticking time bomb," a Japanese Takata executive couldn't muster much response beyond a confusing written statement and passive opposition to demands that the company expand its recall beyond areas including Florida and Hawaii.

Here's how it went when Sen. Edward J. Markey, D-Mass., pushed Takata Vice President Hiroshi Shimizu to agree to the nationwide recall.

"It's hard for me to answer yes or no," Shimizu said.

"It's not hard to answer yes or no," Markey replied.

"I can't answer," Shimizu said.

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"I'm going to take that as a 'no,'" Markey said. "I think you're plain wrong."

Have you lost confidence yet? Wait, there's more. Problems with Takata air bags go back years. Based on media reports and testimony, we know Takata switched propellants sometime after 1999 to a chemical compound, ammonium nitrate, that may have been cheaper and easier to use but could become unstable if exposed to moisture and temperature changes.

According to Reuters, for a period from 2000 to 2002 some propellant used to make Honda air bags was improperly stored at a factory, leaving it vulnerable to moisture. There were other issues: A component known as a wafer was prone to defects, while some air bags were produced with six wafers instead of seven. Additionally, Takata had a faulty record-keeping system, leading to more recalls than might have been required.

Takata says those problems have been fixed, but acknowledges that malfunctions continue. "Almost all of these incidents involved vehicles that spent their lives mostly in areas of high absolute humidity," Shimizu said in written testimony.

Turn that statement around and it becomes a clear argument in favor of a national recall: Not all incidents have occurred in humid climes. There are reports from California, North Carolina and Arizona.

Why has Takata been resistant? There's a huge cost difference between a regional recall of 8 million vehicles and a national recall of 20 million or more.

The NHTSA gave Takata until Tuesday to respond to the national recall demand. Company executives are due for another congressional hearing on Wednesday and are under pressure to provide clear answers to what went wrong. The company needs to be upfront about its problems and accept the cost that comes with a national recall.

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OPINION

ORLANDO SENTINEL

Firms, regulators share blame for lethal air bags

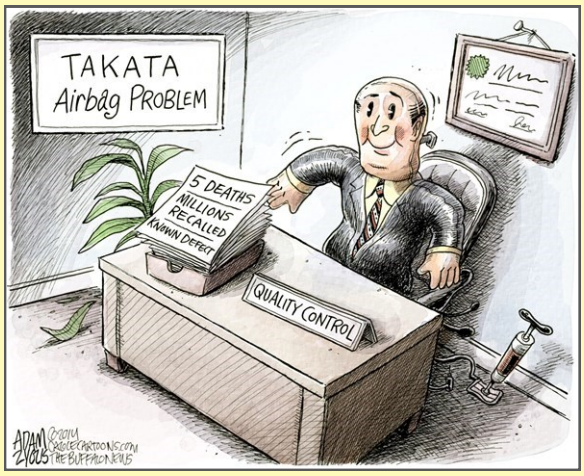
Honda and Takata were aware of exploding air bags for at least a decade before major recalls were ordered.

An Orlando woman was killed by safety equipment that should have saved her life: an air bag.

Safety equipment in Hien Tran's car that should have saved her life instead killed her.

In a minor traffic accident on her way home from her Orlando workplace, Tran suffered horrific neck wounds. She died in the hospital three days later without regaining consciousness.

Investigators were baffled over the cause of her injuries until they saw reports of exploding air bags in older Honda models such as Tran's Accord. Lurking like a grenade hidden in a pillow, the defective air bags deploy with such force that they send shrapnel hurtling through the passenger compartment.



A week after Tran's death, a recall letter arrived to replace her air bag.

Tran's story is tragic enough, but it wasn't the first time such a malfunction led to serious consequences. Flying debris linked to faulty air bags has slashed, blinded or killed dozens of drivers.

Yet such suffering was unnecessary. Both Honda and Takata Corp. of Japan, the air bag manufacturer, were aware of the threat for at least a decade.

The timeline reflects outrageous negligence by those companies and the National Highway Transportation Safety Administration.

In 2004, Honda knew that an exploding air bag in an Accord injured an Alabama driver, The New York Times reported. Three years later, the automaker learned of more injuries from the same defect. Yet it wasn't until late 2008 that Honda issued a limited recall without mentioning the threat of injury.

Meanwhile, Takata came up with a variety of feeble excuses for the defective bags as injuries mounted. It first blamed the problem on high humidity at one plant, then on a defective machine, and finally on worker error, the Times reported. Such vital information passed quietly between Honda and Takata without wider release.

Where were federal regulators during all of this? Honda reported the events on a form that is too short and vague to reveal dangerous flaws. In 2009, when NHTSA finally did investigate, its cursory effort ended quickly because of "insufficient information," the Times reported.

Honda evaded scrutiny by settling air bag lawsuits out of court with stipulations to keep details a secret. Takata denied to other automakers who used the same air bags that the defect extended to them. Finally, in 2013, Takata admitted a wider problem with its product, resulting in current recalls by 10 automakers involving nearly 8 million cars.

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Honda and Takata have acted with shameful disregard for human life. And NHTSA has been, if not an enabler, a watch dog with no bark and false teeth.

Some in Congress have finally taken notice. This week, Florida Sen. Bill Nelson called for daily fines of offending manufacturers and free loaner cars for drivers awaiting air bag replacement.

It is the least regulators and carmakers can do before there is more blood on their hands.

OPINION

USA TODAY

Air bag recalls deadly slow: Our view

by USA Today editorial board

Automobile air bags save about 2,300 lives each year, so when they instead turn deadly — exploding and spewing shrapnel into drivers' bodies — you'd expect urgent action to get the defective products off the road.

Instead, air bag maker Takata and its biggest customer, Honda, conducted glacial, piecemeal recalls that have left drivers in jeopardy.

The reason is no mystery. For Takata, one of the world's largest air bag suppliers, the problem might pose an existential threat. And for Honda, finding and replacing the faulty air bags — installed in many models for many years — imposes a massive cost.

The automaker started by recalling about 4,000 Hondas in 2008, and recalls are continuing today. Along the way, several other automakers have joined in; Nissan expanded its recall on Saturday.

As the recalls dragged on, four people died in the U.S. in accidents linked to the air bags. More than 100 were injured. And until recently, the federal car safety watchdog — the National Highway Traffic Safety Administration — has blessed the whole sorry response.

NHTSA: We've acted quickly, forcefully

The air bag saga took a sinister twist last week, when *The New York Times* reportedthat two former Takata employees have accused the company of hiding the defect a decade ago after an air bag ruptured in Alabama. According to *The Times'* report, the employees said Takata secretly tested 50 air bags, found a dangerous defect, and ordered that evidence destroyed instead of reporting it to NHTSA. (Takata called the allegations "fundamentally inaccurate" but refused to answer questions.)

The coverup allegations warrant a criminal investigation of Takata, and NHTSA's response also deserves more scrutiny.

When companies fail to act responsibly, it's up to NHTSA to step in. But the agency has fumbled again, just as it did when General Motors failed so deplorably to fix deadly ignition switches.

Initially, Takata blamed its rupturing air bags on a foul-up at a plant in Moses Lake, Wash., and a different problem at a plant in Mexico. In June, Takata blamed exposure to "high levels of absolute humidity" where the cars are driven and agreed to recalls in Florida, Hawaii, Puerto Rico and the Virgin Islands.

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This makes little sense. Other parts of the USA also experience persistently high humidity, and some recalls have expanded to those areas. Last fall, the death of a driver in California was linked to the defect. After more than 12 million cars from 10 makers have been recalled and air bags are still rupturing, why would NHTSA put faith in Takata's advice?

Or for that matter, in Honda? The car maker has strung out recalls over six years. In 2009, it reported to NHTSA what it euphemistically called "unusual driver air bag deployment" after debris killed an 18-year-old Oklahoma driver.

Finally, in recent weeks, the agency ordered Takata and Honda to answer questions under oath. It issued a warning to drivers to "act immediately" to heed recalls, particularly across the Southeast. But that leaves other parts of the country at potential risk — and the question of why NHTSA allowed this slow-motion wreck to go on so long.

AND THEN THERE'S THIS…

Super-sized crash-test dummy reflects growing American waistlines

by Gordon Hard, Consumer Reports, 3 December 2014

Super-sized crash-test dummy reflects growing American waistlines

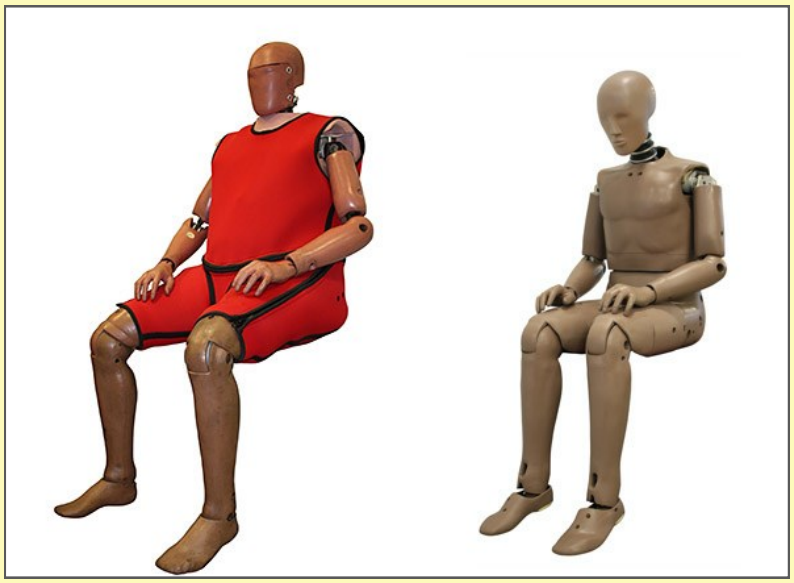
There's no hiding that Americans have gotten steadily plumper over the last several decades. As a result, auto safety researchers may be welcoming a new member to the crash-test-dummy family, a rather obese male.

Developed by Humanetics of Plymouth, Mich., the largest U.S. maker of instrumented crash dummies, the big guy is six-foot-two and weighs 273 pounds. And it's not all muscle.

Oversized dummies have been used in crash research for years, but this one is not just tall but, you know, kind of heavy.

"As we put on weight, it's not evenly distributed," explains Humanetics CEO Chris O'Connor. "Most of us get a lot thicker in the middle. One of the problems, as a driver, is that that puts you out of position for the seat belt. You're sitting farther forward in the seat, and the belt isn't pinning down your pelvis but running across your belly, and that isn't good."

It could be time to add a larger-statured individual to the repertoire. The Centers for Disease Control and Prevention (CDC) calculates that about 35 percent of the adult male population is obese, up from just 11 percent in 1960. This obese dummy will join a line of ever-more sophisticated crash dummies currently used for automobile crash tests, ranging from a 12-month-old infant, to a petite adult female, to an average-sized (50th percentile) adult male.



It's long been recognized that plus-sized folks may fare less well in crashes than average-weight drivers, but a recent study from the University of California at Berkeley has tried to quantify the risk. It found that obese people were about 50 to 78 percent more likely to die from crash injuries than average-weight people.

According to Russ Rader, a spokesman for the Insurance Institute for Highway Safety, "Several factors raise the risk level for overweight people. For one thing, heavier people put more strain on the seat belts and air bags during a crash. And if seat belts are uncomfortable or hard to buckle, they may not be used. Obese people may also have health issues that add to their vulnerability."

Dummies are typically purchased by automakers for internal crash testing, as well as by the National Highway Traffic Safety Administration for their federally funded tests.

When asked, a NHTSA spokesperson said that they were "aware" of the new dummy, "but it's too soon to speculate on if it would ever be added to our program or family of dummies."

IIHS' Rader told *Consumer Reports* that the organization had no plans yet to purchase the new plus-size dummy.

"It's not clear how much we would learn, since we're more focused on the integrity of the car's structure. If the passenger compartment stays intact then the size of the dummy doesn't matter so much. But other researchers, especially

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those studying restraint systems, might be very interested."

Cost may be an issue, too. Crash dummies run about $500,000 apiece or more, depending on how many sensors they have.

"You can have literally thousands of data channels on these devices," Humanetics' O'Connor said. "They're expensive, yes, but they're made to last for decades."

TECHNICAL CORNER

The Monte Carlo method in accident reconstruction

by Frank Owen, Alpha Omega Engineering, Inc., www.aoengr.com

This is a simple introduction to the Monte Carlo method as it applies to accident reconstruction. This article merely describes what the method is and how it can be used to deal with uncertainties in AR. This explanation is based on the presentation on this topic by Roger Barrette given at the 2014 CAARS Annual Conference in South Lake Tahoe, California 23 October 2014. Thanks Roger.

A common problem with accident reconstructions is that usually parameters (drag factor, approach and departure angles) are "fuzzy", that is they are best characterized by a range of values rather than one fixed, definite value. The drag factor is 0.75±0.1, for example. In an oblique collision, there are eight variables used to calculate the impact speeds of the two vehicles: the weights of both vehicles, the approach angles of both vehicles, the departure angles of both vehicles, and the post-impact speeds of both vehicles.

Seven of these eight parameters have values that are "fuzzy", that are represented best by a range. We take one vehicle's approach angle to be a set value. Then we deal with the seven fuzzy values using a variety of methods, each of which has its weaknesses. If we use the median value of each fuzzy value, we arrive at a median result. But how certain are we of this result, and what is the range of possible feasible results around it? This uncertainty weakens a case, especially when the expert says that he or she has no idea of what the possible range of values around the median is or what the level of certainty in the median result is.

A possible strategy for countering this weakness is to calculate a range of possible results by selecting the upper or lower end of each variable's range that will lead to a high and a low value for the impact speeds of both vehicles. The problem with this is that it is highly unlikely that in a crash scenario, all of the parameters will actually have a value at their high or low ends. Thus this approach overstates the range of possible impact speeds of the two vehicles involved in the crash.

The Monte Carlo method deals with this situation using random numbers and statistics and probability. The calculation of the impact speeds is automated. Then this calculation is performed a large number of times, selecting values inside the range of each of the fuzzy parameters for each calculation. How are these values selected? Answer: randomly. It's like throwing the dice for each variable to select a set of seven hard numbers for each calculation. This is done many times. How many? 105,000 times for the oblique-collision problem cited. This number, I believe, has simply been determined by trial and error. It works for oblique collisions.

What this results in are 105,000 answers for the impact speeds of the two vehicles. These can be collected and compiled into a *histogram*, which basically displays how many times a particular answer came up. Below is shown such a result from Roger's presentation at the CAARS conference. Notice that with a random selection of the seven parameters, we get a bell-shaped curve that is a *normal distribution*. Through statistics we actually can quantify more features about

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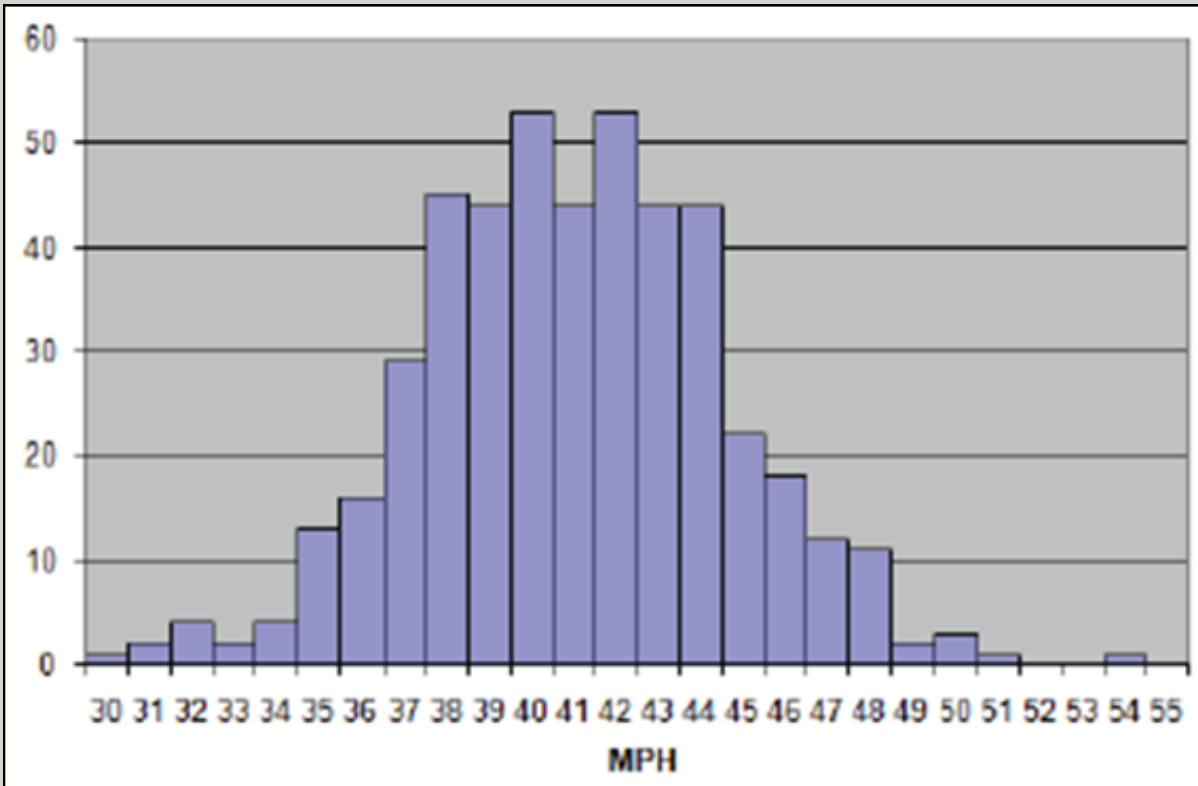

Histogram of impact speeds using Monte Carlo method

these results, answering such questions as what the likelihood is that an impact speed was between 37 and 45 mph. Thus if the question comes up in court of what the certainty level is for a particular range, scientifically accepted hard numbers can be cited. You can say something like "I'm 83.2% certain that the range lies between *x* and *y*." If you are challenged on this, you can show easily where the 83.2% figure comes from. You can be definitive about uncertainty, and that is a powerful tool to take with you into the courtroom.

One other thing that can be seen from the figure is that if the alternative methodology is used to calculate the lowest possible impact speed (30 mph) and the highest possible impact speed (54 mph), this overstates the probable impact speeds significantly, as these probabilities are highly unlikely.

This is just a very brief overview of what the Monte Carlo method is and how it is applied. It can be applied to any engineering problem with fuzzy values. And variants of it can be applied, depending on particular situations. For instance, for a drag factor between 0.65 and 0.85, it may be known that the likelihood of the value being between 0.75 and 0.85 is much greater than the likelihood that it is between 0.65 and 0.75. This added information can be built into the selection of values between 0.65 and 0.75 so that twice as many are selected in the higher range than in the lower range when doing the large number of calculations.

One other tactical advantage of the Monte Carlo method is that it is not well understood in accident reconstruction. Thus it is likely that the opposing side will not apply it to uncertainty. Thus their case is weakened by the uncertainty… and your side is strengthened by it. It looks as if you know better how to deal with uncertainty than they do. And that is because you are dealing with uncertainty in a scientifically accepted manner.

To understand Monte Carlo better, you really need some elementary understanding of statistics. I'll put it on my list of Technical Corner items to discuss in future newsletters.

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