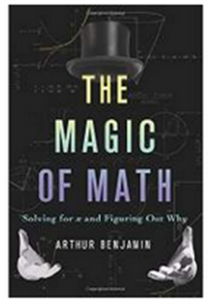
Two wheels, more power: The 2015 Kawasaki Ninja 1000 ABS motorcycle features traction control and ABS. But its most significant characteristics, in my opinion, are a one-liter, inline, four-cylinder engine which produces 142 horsepower and has a redline of 11,000 rpm which is installed in a 500-pound bike—the latest in crotch rockets. Just thought I'd throw that in for a little eye opener.

I'm sure we have all seen a variety of street and highway lighting—some distractingly bright, some so dim as to be essentially worthless, and the not-so-unusual but misleading case of bright luminaires separated by a substantial distance so drivers pass through regions with alternating brightly lit road to virtually no illuminance other than the vehicle's headlights. That last case can be very dangerous for pedestrians in the dark zones—eyes adapt more readily to the bright regions than to the dark, making observations of objects in the dark zones difficult or impossible for the motor-vehicle operator. What to do?

According to an article in the February 2016 edition of LD+A, the magazine of the Illuminating Engineering Society of North America, designers of roadway lighting systems should soon be getting some help with designing systems that are "just right." The Federal Highway Administration has contracted with the Virginia Tech Transportation Institute to investigate the relationship between lighting level and safety. Most previous studies have been conducted on the basis of lighted or not lighted. These latest studies are working to determine the relationship between the level of illuminance and the frequency of night crashes versus day crashes in each selected region. Also, the color temperature of the street lighting is included in the evaluation. It is hoped that these studies will allow designers to design lighting systems that optimize safety while minimizing operating cost. As with many other studies, time will tell. I'm not holding my breath.

The photograph at the upper left of the column to the right shows a new flash system that I have recently acquired. This is a Nissin Di700A flash with Air 1 Commander. The Air 1 unit mounts on the camera's hot shoe and will fire the flash with the camera's shutter, controlling the intensity of the flash by through-the-lens (TTL) control as if the flash had been mounted on the camera's hot shoe. The manufacturer alleges that this system will provide wireless triggering over a distance of up to 98 feet; I won't be testing that, as far as I know. But I also bought a second flash unit, and I have configured the Air 1 to fire both simultaneously. Imagine the photographic possibilities. But I believe my best use for this system will be in field applications where I can't get a decent picture with the flash mounted on the camera's hot shoe. I have had a hot-shoe adapter and corded remote hot shoe for many years, but this new device does not have the physical limitations of the corded system. Each flash also came with a plastic foot which includes a brass threaded female fitting on the bottom, so that the flash can be mounted on top of a tripod. I bought this system for my Sony cameras with the multi-interface shoe; this system is supposed to be available for late-model Canon and Nikon cameras. And, for those of you who care about color temperature of the flashes, the color temperature is 5600K, to provide illumination with essentially the same color balance as natural sunlight on a cloudless day. I don't know how durable this system will be—I've never used this brand before—but I love it already.



The image below the flash system is from a book I recently purchased for my daughter to read to help her understand her high-school math better. Before passing it along to her, I read it myself to be sure it was something I wanted her to read. It is!

The title of the book is "The Magic of Math. Solving for *x* and Figuring Out Wh*y*," by Arthur Benjamin, Basic Books, New York, NY: 2015. I purchased my hardcover copy from Amazon, where it is also available in Kindle format and in softcover. This book covers a wide variety of topics, from basic arithmetic to some algebra, trigonometry, geometry, and even a little calculus. It specifically explains the seemingly abstract concepts of the numbers *i* and *e* as well as much detail on the topic of π and an entire chapter on infinity. I highly recommend this book to anyone who is interested in a greater understanding of mathematics and/or physics . Math, after all, is the language of nature.

Bosch Crash Data Retrieval (CDR) Toolkits keep getting larger. Bosch has just released a new cable for late-model Fords, and they now have a single cable for connecting the serial port on the interface to a USB port on a computer. When this CDR system was first developed, there were no USB ports, so it was set up to connect to computers through the computer's serial port; virtually every computer had at least one serial port back then, and some had two. But, with the introduction and essentially universal acceptance of the Universal Serial Bus, serial (COM) ports became obsolete. I don't believe you could find a new notebook/laptop computer with a serial port. Some of the newest ones don't even have USB 2 ports—they are all going to USB 3 ports. So, when USB ports began to replace serial ports, Bosch developed and sold a special connector to go from the computer end of their serial connector cable to a USB port. They have finally developed one cable with a serial (COM) connector at one end and a USB connector at the other. Although I didn't have to have it, I decided to get one, since it simplifies the setup for interrogating an Airbag Control Module or a Powertrain Control Module.

While on the topic of CDR, I should mention, perhaps for the first time in one of my newsletters, that a Bosch CDR Report should not be accepted without a situationally complete reconstruction of the involved crash. There are many reasons for that requirement. Let me start by writing that repeated tests and analytic procedures have demonstrated that the data set stored in a vehicle's ACM and/or PCM is accurate based on the inputs provided by the various sensors in the vehicle. But there are a number of caveats associated with the various data points and sets.

Perhaps the simplest of the possible issues with a CDR Report relates to the seat belt switch status. The clasp and release mechanism for each of the two main front seat belts has a switch which is supposed to "tell" the airbag control module (ACM) whether or not the buckle is

present in the latch. However, that switch may have been damaged in use and may not accurately indicate the buckled/unbuckled status of the seat belt. Most late-model vehicles have pre-tensioners on the retractable part of the webbing; the pre-tensioners fire before or at the same time as the airbags. Once the pre-tensioners fire, the webbing is locked into its position at the time of the deployment. Finding webbing banjo-string tight against a B pillar after a crash shows that the belt was not being worn at the time of the crash. Finding webbing loose across the seat shows that the seat belt was being worn. But be careful—the seat belt could have been buckled while the driver or passenger sat on it. A belt that was worn at the time of a crash which fired the pre-tensioner should be loose enough to **almost** be re-buckled at a later date over the same person who was sitting there at the time of the crash.

Another aspect to beware of is the concept of principal direction of force (PDOF). Early event data recorders (EDRs) in ACMs only recorded longitudinal acceleration; all but a very few crashes involve both longitudinal and transverse (lateral, or broadside) acceleration, and there is often a vertical component, although that is often small. Now, many of the EDRs that record acceleration in longitudinal and transverse directions will also report "maximum delta-v," but that is the vector sum of the highest values of the longitudinal delta-v and the transverse delta-v. Unless they occur at the same moment in time, that reported maximum delta-v is incorrect. But further discussion about PDOF is a much more detailed topic.

The most misleading component of a CDR report can be the speed at one-second (or similar) intervals before algorithm enable (AE), which is essentially the instant of impact plus some usually small amount of milliseconds. One might see 45 mph at -5 seconds, 43 mph at -4 seconds, and 0 mph for the remaining three increments of pre-collision recording. Did the vehicle stop? No! The drive wheels stopped turning because of hard braking; the ACM "knows" the vehicle speed by the road speed being reported to it by the rotation of the driven wheels. In a similar situation, a car with fully functional ABS will not show a speed of 0 mph at any time increment unless that car had fully stopped, but the reported speed during braking will be somewhat less than the vehicle's actual speed over the road.

And then there's the case of "crazy" speeds. The reported speed might start out at 60 mph, then go to 90 mph or some similarly high number and stay unnaturally high up to the instant of impact. Did the vehicle accelerate from 60 mph to 90 mph in one second? No way! One driven wheel or both driven wheels were no longer making proper contact with the ground; either they were spinning on a slippery surface, like ice or mud, or the vehicle had become airborne such that the drive wheels were no longer touching ground.

These are a few of the caveats associated with a CDR Report. The numbers aren't "wrong" from a standpoint of information supplied to the ACM by switches and sensors in the car, but they may not be an accurate characterization of the true vehicle condition, event, or value being reported to the ACM by the information on the vehicle's data busses. Please contact me whenever you have a question about CDR or other vehicle-related topics.

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