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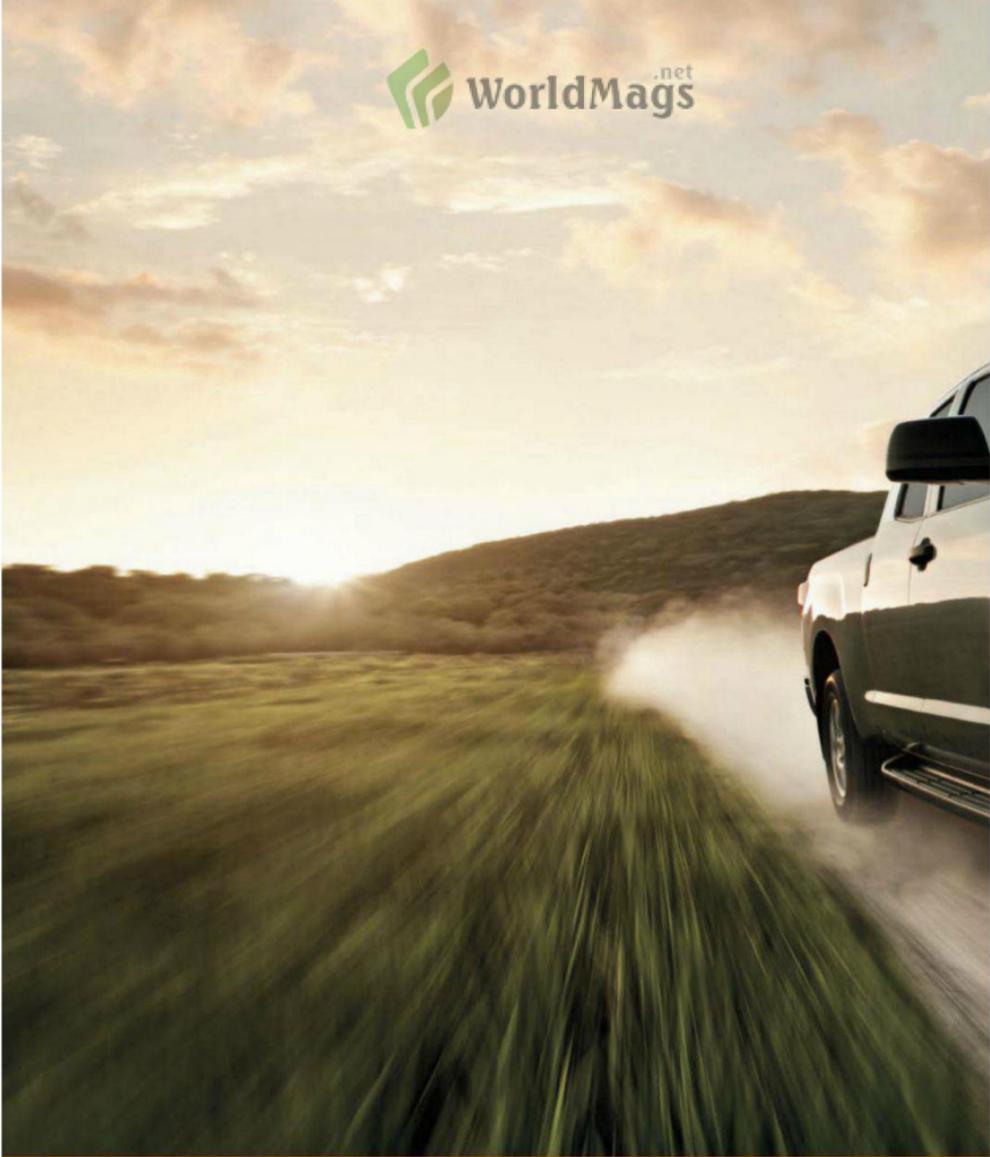
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ROAD & TRACK

VOLUME 63 NUMBER 11

...from a nascent flicker on a designer's computer screen, to radical concept cars shimmering beneath auto show lights, to an intriguingly unorthodox race car destined to scream down the Mulsanne Straight, we've seen the future. And for the car enthusiast, it's been worth the wait.

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FOCAL POINT

WING AND A PRAYER

Mike Levitt was on top of the 13-story Holiday Inn when he took this dramatic shot of an AMX A-1 fighter jet doing a low-level pass at the IndyCar São Paulo 300.

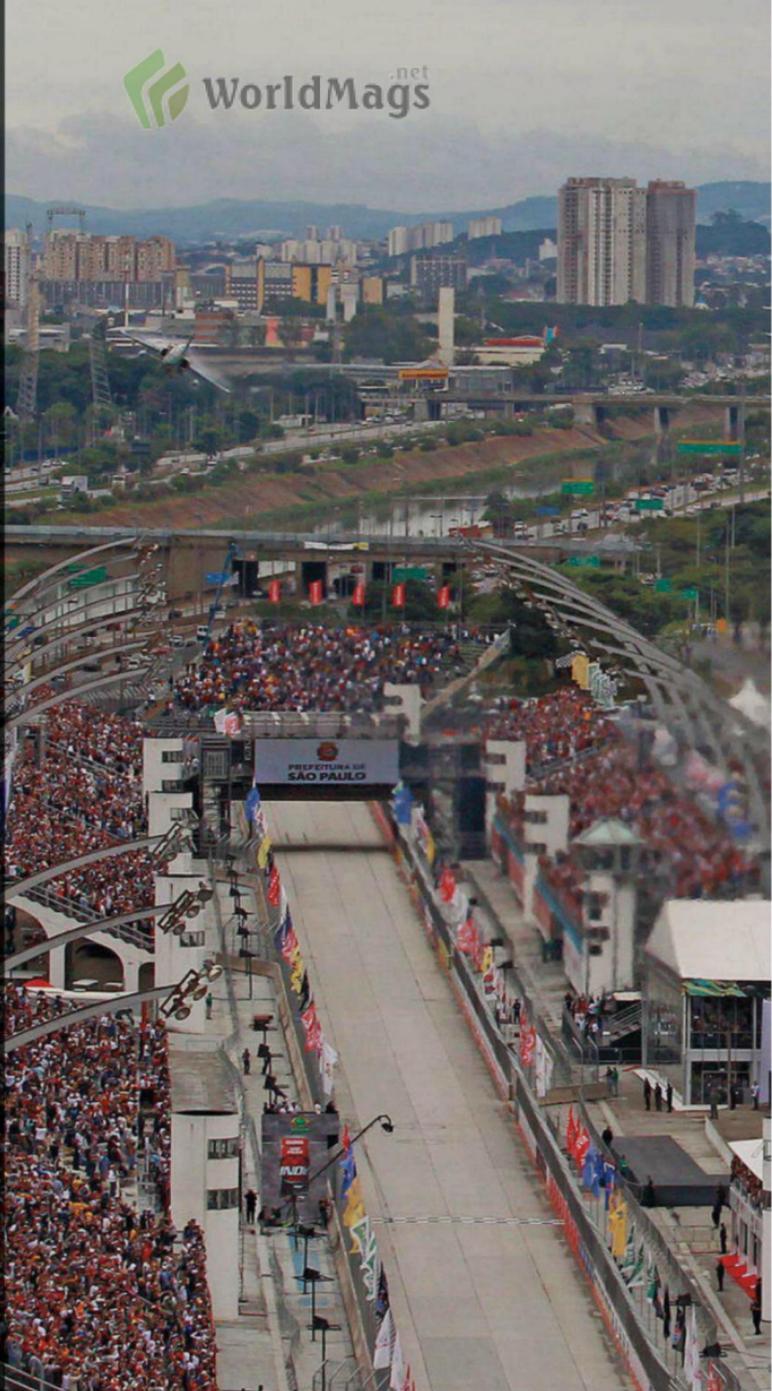
"The guy went almost on his side to miss the building," recalls Levitt. "It was spectacular. Had this been in the US, that plane would have been 1000 ft. above us."

PHOTO BY MICHAEL LEVITT/LAT

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THE FUTURE IS NOW

Want to know what kinds of cars we'll be driving in the next decade? Check out these five very intriguing concept cars, which paint the way toward a bright enthusiast future.

DRIFTING EYE CANDY

We're having some rear-drive drifting fun with Formula D Champ Dai Yoshihara, who puts the Subaru BRZ, Hyundai Genesis Coupe and Mazda Miata at some seriously entertaining slip angles.

SUBARU BRZ VS MIATA & GENESIS

How will Subaru's new rear-drive BRZ stack up against the Mazda Miata and Hyundai Genesis Coupe atop the hill of affordable rear-drivers? Check out this video and find out!

DELTAWING TAKES FLIGHT

The radical DeltaWing race car hit the track for the first time earlier this year at Buttonwillow. We were there, and we talked to the drivers who experienced the car on its initial shakedown run.



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ROAD AHEAD

BY MATT DeLORENZO
EDITOR-IN-CHIEF

Places to Go

IT'S SUMMER AND TIME TO HIT THE ROAD. AND while getting there behind the wheel is more than half the fun, sometimes where you end up makes the trip that much more rewarding.

A French proverb holds that a good meal ought to begin with hunger. The corollary is that a good trip should begin with an interesting destination in mind. Here are few places that should be on your road trip calendar over the next few months.

Topping my list is The Hawk with Brian Redman at Road America, July 12–15. Formerly known as the Kohler International Challenge, the event is now sponsored by the maker of high-performance racing brake products, which is a nice fit at Road America, especially for those familiar with Turn 5. This year's event will honor Lola and Can-Am, and again features the *Road & Truck* Concours Friday and Saturday in downtown Elkhart Lake. Peter Egan will be on hand to help judge the concours and possibly race his Crossle.

Another not to be missed event will be the Super Weekend at the Indianapolis Motor Speedway, July 26–29. This action-packed event features Nationwide stockers practicing Thursday, the oval switched over to the road course for Friday's card that includes a 2.5-hour Grand-Am Continental Series race, followed by the Rolex DP and GT class event. Then the crew goes to work and changes the Speedway back to the oval for

Saturday's Nationwide race and Sunday's Sprint Cup 400-miler. Of course, in addition to all this racing action, those who really like big trucks and construction equipment will love the car hauler parade around the track, as well as the forklifts and other machines that will be used to switch the oval to road course and back again in hours (instead of the usual days).

August's road trip destination should be the Pebble Beach Concours d'Elegance and Rolex Monterey Motorsports Reunion. Now that the Shelby Cobra has turned 50, it's only natural that it would be featured both on the lawn at Pebble and the circuit at Mazda Raceway Laguna Seca. But beyond that, Pebble has a way of turning out cars that you've never seen before and this year promises a bonanza with a class dedicated to the rides of the Maharajas, the one-off cars created for kings and other potentates. At the same time, there will be another group of sport customs—one-of-a-kind cars built on existing or hand-fabricated American chassis from the 1930s through the 1950s. I view it as sort of a prince and the pauper approach to the program.

Finally, plan on taking a grand trip to England for the Goodwood Revival, Sept. 15–16. It promises to be epic, as Lord March has lined up at least 10 actual and re-created Silver Arrows, the legendary German 1930s Grand Prix machines

from Mercedes and Auto Union to race at Goodwood. In addition to turning the cars loose on the track, the infield will feature a re-creation of the pit/paddock complex from the Swiss Bremgarten Circuit. Also helping create the right atmosphere is Lord March's strong suggestion that participants and attendees alike come dressed in period costume. This event is truly the best way to wrap up what promises to be a memorable summer of cars.

On the subject of destinations, the other place we go this month is the future. It starts with John Lamm's story on the Ital-design Brivido in Ampersand (as well as a few other tasty show car treats from the auto show circuit), and includes our beautifully photographed cover story on the five concepts that will shape the enthusiast's future. Further on, Tim Considine takes an up-close look at the DeltaWing, a car that very well may change the face of future endurance racing. In the words of that iconoclastic trio, Timbuk3, "The future's so bright, I gotta wear shades."

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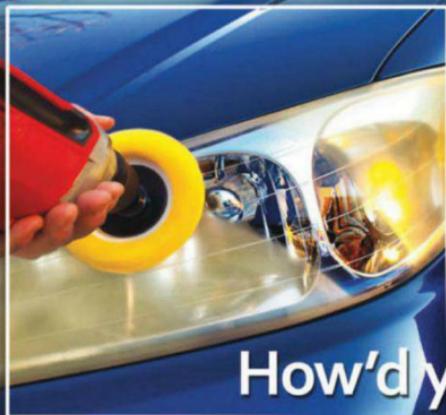
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Italdesign BRIVIDO

From concept to Col de Vars



PHOTOS BY JOHN LAMM

TURNTABLE QUEENS. LOVELY to look at, delightful to photograph, but hey, pal, hands off!

Most concept cars fall into this category. Except that we've just been over France's Col de Vars at some 6900 ft. and there's snow banked on both sides. Back some kilometers ago we topped 120 mph and Italdesign's Brivido concept is ready to take on more.

Yes, that's Italdesign's one-off 2012 Geneva Show concept machine. When launched, Giorgetto Giugiaro proclaimed of the Brivido, "My intention has always been to design something that is close to industrial reality and can easily be released into the market." The Brivido has a good start on reality.

There are other indications a vehicle like the Brivido (Ital-

ian for "thrill") could become reality. Now a part of the Volkswagen Group, Italdesign will be providing concepts for all 11 of its brands, including Ducati. As part of this arrangement, Italdesign now has the advantage of drawing from the considerable parts inventory of the VW Group when creating concepts. In the case of the Brivido, it is a 360-hp blown V-6 gas/electric hybrid powertrain that is claimed to propel the car to 62 mph in 5.8 seconds. Top speed is said to be 170 mph and yet all the expected hybrid character remains. In fact, the powertrain and general size of the Brivido lead to the suspicion that perhaps the Porsche Panamera platform is used as a base (both are within a half-inch of each other in length), although Italdesign

denies it. Still, it's interesting that VW Group is developing a new platform about this size for use by Porsche for the next Panamera, Bentley for a smaller sedan, Audi for the A9 and perhaps even the Bugatti Galibier sedan.

In another bit of corporate cooperation, Italdesign worked with VW's Electronics Research Lab in Palo Alto, California, to create the Brivido's interactive electronics and displays. Pre-program what you want to do from navigation to climate controls to entertainment on your iPad, slide it into a slot on the passenger's side of the cockpit and the car will adjust to your settings.

All this tomorrow tech is wrapped up in an advanced Giugiaro design. Think of this as an answer to 4-door coupes

like the Mercedes-Benz CLS and Audi A7, but with gullwing doors for easier access. And, as we can personally guarantee, plenty of rear seat comfort at speed. But aren't gullwings heavy? Probably not when done in carbon fiber. These doors add personality to the vehicle, make tight parking spots more accessible and front entry and exit easy, although the rear takes a bit of effort to get into.

While it is a driveable prototype as shown by its participation in the Louis Vuitton Classic Serenissima Run from Monaco to Venice, it's not ready for production. But it does provide a hint of exciting vehicles to come from both Italdesign and its new owner.—John Lamm

MORE ONLINE  roadandtrack.com/Brivido



■ The spanning gullwing doors on the Italdesign Brivido are constructed of carbon fiber and open to reveal a high-tech cabin designed in conjunction with parent company Volkswagen's Electronic Research Lab in Palo Alto, California.



BERTONE NUCCIO

Italian wedge comes to life

BERTONE MAY HAVE SOLD OFF ITS GRUGLIASCO ASSEMBLY plant outside of Turin (new owner Fiat Group will build a smaller sedan sibling to the Maserati Quattroporte there) but the struggling design house shows that dreams die hard as shown by the wildly styled Nuccio concept.

This handbuilt Italian creation displays cues from some of Bertone's 100 years of previous work, cars such as the Alfa Romeo Carabo, Lancia Stratos Zero and the Lamborghini Countach. Powering the highly raked vehicle is an Italian-sourced 4.3-liter V-8 engine capable of 480 bhp. With no more interest in series production, the Nuccio will likely be little more than a one-off tribute to the company's founder.—*Carter Jung*



PHOTO-ILLUSTRATION BY CHRIS USANE

2014 SRT VIPER ROADSTER Reptile to drop its top

WHILE NO FORMAL ANNOUNCEMENT has been made by the SRT camp regarding a drop-top version of the new Viper, odds are in favor of one. After all, Vipers were roadsters first and coupes second, historically. As for the new Viper

Roadster, the carbon-fiber roof will be most likely swapped out for an automated cloth top, similar to the previous-generation Viper's. The new coupe form of the SRT Viper is estimated to tip the scales at 3320 lb., so expect the

convertible Viper to weigh a similar amount. As the new steel space-frame chassis is an evolution of the outgoing Viper's—which was originally designed as a roadster—weight from additional bracing should be kept to a minimum.

In fact, in previous tests of the Viper, the roadster weighed 30 lb. less than the coupe (3450 lb. for coupe, 3420 lb. for roadster). The stout 8.4-liter V-10 engine churning out 640 bhp should remain largely unchanged.—CJ

MERCEDES-BENZ CONCEPT STYLE COUPE

Future CLA 4-door coupe ready for tomorrow

WITH ITS 4-DOOR COUPE configuration, pronounced center grille and strong swooping curves, the Concept Style Coupé's (CSC) styling sees a heavy infusion of the F800 concept from 2010—with the addition of diamond grillework inspired from last year's Concept A-Class. Finished with Mercedes' Alubeam paint, the CSC's shimmering exterior is

accented by the glow of the LED headlights equipped with mechanized turn signals. Underneath the panoramic roof, the cabin is a mix of light gray, anthracite, neon green and black chrome accents. Carbon fiber, Alcantara, suede and nubuck leather are some of the premium materials used to wrap the surfaces.

The CSC is powered by a

direct-injected turbocharged 2.0-liter 4-cylinder producing 208 bhp. The drivetrain employs a 7-speed dual-clutch transmission and 4Matic all-wheel-drive system.

Take away the concept materials, grille and wheels, and the CSC is a preview of what the new Mercedes CLA will be. We hear it's 90 percent there. Sized close to the C-Class, expect the CLA to come in at a price below the current entry-level sedan's. Look for the production CLA to bow sometime next year.—CJ



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The Academy of Art University Automobile Museum currently contains 55 cars arranged—artfully, you'll not be surprised—in what used to be an auto dealership along the city's Van Ness Avenue. The venue is a bright one, all the better to walk around and examine the cars closely.

Details: Academy of Art University Automobile Museum, 1849 Washington St., San Francisco, California 94109; academyautomuseum.org. Tours may be scheduled Tuesdays, 11 a.m. to 1 p.m.; Thursdays, 2–4 p.m. Admission: \$10 per person (proceeds donated to the Rotary Club and the Boys and Girls Club).

—Dennis Simanaitis



PHOTOS BY DOREEN GILLARD



ALFA ROMEO 4C

Maserati to build it

REMEMBER THE ALFA ROMEO 4C concept from the 2011 Geneva Auto Show? This featherweight carbon-fiber sports car powered by a mid-mounted turbocharged 1.8-liter 4-cylinder putting out 200 bhp heralds Alfa's return to the U.S. The question of where it will be built has been answered as Maserati confirmed it will assemble the coupe at its Modena plant. Expect it to arrive in 2013 priced above \$50,000—right in Porsche Cayman country.—CJ





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Optima Chargers Digital 1200

Optima, known for its deep-cycle batteries, has released its first 12-volt battery charger. Housed in a case design similar to its batteries, the 12-amp Digital 1200 charger features robust construction with a backlit LCD display, DC charging clamps with LED work light and USB output to charge devices such as smartphones. The microprocessor-controlled unit is efficient, offering multistage charging, conditioning, maintaining and reconditioning modes, helping to extend the life of a car's battery.

\$200
www.shop.optimabatteries.com

Luminox Tony Kanaan Version 3

Luminox has released another watch in the Tony Kanaan Series, honoring the 2004 season IndyCar series champ. With its yellow and green accents, the Version 3 watch reflects not only the traditional color scheme of the Brazilian flag, but also Lotus, the team Kanaan drove for after leaving Andretti Autosport. The initials "TK" are emblazoned on the watch's face above the "4" hour mark and standing in for the "8" hour is 82, Kanaan's car number last year. The limited-edition watch measures 44 mm in diameter and the 316L stainless-steel case is individually numbered on the back from 001 to 999.



\$1200
www.luminox.com

BMC Impac Lamborghini Edition

Swiss bicycle maker BMC is offering a limited-edition racing bicycle co-branded with Lamborghini. It's not just a licensing deal either, as BMC and Lamborghini share a passion for quality materials and carbon fiber. The Impac (short for impeccable) bike has a saddle and handlebars covered in Lamborghini suede, the frame and wheels are made of carbon fiber, and the color is the same Argo Orange found on the Aventador. BMC is building only 30 of these exclusive Impac Lamborghini Edition bicycles.

est \$26,000
www.bmc-racing.com



A renowned automotive designer, Ian Callum is responsible for such notable works as the Aston Martin DB7 and Vanquish, and the Nissan R390 Le Mans race car. The British designer started at Jaguar in 1999 where he would go on to help pen the XK, XF, XJ, C-X75, C-X16 and the new F-Type.

1

Can you tell us how the new F-Type came about?

I've been waiting 10 years to do this car. We had two stabs at this previously. But the brand wasn't ready for it. Now we are and I think the car speaks for itself.

2

Why has it taken so long?

No car is easy to design these days. Sports cars are a bit more straightforward than a family car. A sports car is an indulgent car. It is for just two persons. But actually, this car has been hugely demanding for the team. I was determined to get purity out of it, which required a lot of discipline. Design people tend to put more into a shape. We wanted to take things out to have a pure shape.

3

Where did you get your inspiration for the car?

There is some influence here from the C-X75, which we are still developing, by the way. I get more pleasure out of the C-X16 concept of its scale. The F-Type will be a more approachable car, rooted in our history of doing C-, D- and E-Types.

4

How close is the F-Type to the C-X16 concept?

It will be quite close to the concept, except that it is a convertible, not a coupe. That is not to say we won't do a coupe.

5

So except for the top, it will be the same?

Concept cars are a bit of a tease, a lot of times you don't deliver. But what's the point then? That's why we want the final product to be as close to the concept as possible.

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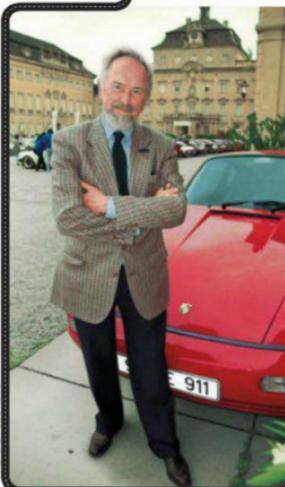


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PHOTO BY JOE RUSZ



Ferdinand A. Porsche

1935-2012

Nothing says "automotive icon" more than the Porsche 911, the company's flagship and its most enduring model. Designed by Ferdinand A. Porsche, who died April 5, the Type 901 as it was known then made its debut at Frankfurt in 1963, five years after the talented designer signed on at his grandfather's firm. In the next decade, "Butzi," as he was known to his intimates, was responsible for the Type 804 racing car and the stunning 304



GTS road/racing car.

After leaving the company in 1972, Butzi founded Porsche Design, a styling studio known for everything from sunglasses to speedboats. —Joe Rusz

It's not big.

The new RDX is an exceedingly nimble vehicle. It has a V-6 engine with innovative Variable Cylinder Management™ that can respond to changing driving conditions and deactivate cylinders. Giving you the power you need and the best highway fuel mileage for a V-6 in its class.* Plus, the speed-sensitive steering has been tuned for more spirited driving. In other words, it drives like it's small, but it's not.

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*2012 city/28 hwy/23 combined mpg for FWD model. Based on 2012 EPA fuel economy estimates for non-hybrid, gasoline-powered V-6 SUVs (SUVs) for sale in the U.S. as of 3/11/12. Use for comparison purposes only. Your actual mileage will vary.

INFINITI EMERG-E CONCEPT

Infiniti emerges with a sporty green vehicle

A "GREEN" PERFORMANCE-CAR concept, the EMERG-E is fitted with a 402-hp range-extended mid-mounted powertrain that delivers gobs of performance. Within its 175.7-in. body, the 2-seat EMERG-E carries a pair of electric motors, a lithium-ion battery pack and four inverters. The EMERG-E is estimated to have a 30-mile range in full electric mode. A 3-cylinder internal combustion engine will add miles to the trip odometer. Infiniti says the lightweight EMERG-E will accelerate from 0-60 mph in 4 seconds.—Sam Mitani



But it's not not big.

The new RDX brings an entirely new definition to personal space. With more than 103 cubic feet of passenger space, it's large enough to accommodate your life. And all the gear that goes with it. The generous shoulder and legroom give it a distinctively cavernous feel. Moreover, the new RDX produces outstanding torque and 273 horsepower. In other words, it feels like it's big, but it's not.

*Introducing the entirely new RDX.
Intelligently built for the size of your life.*

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*Prize does NOT include transportation, meals or lodging.

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PHOTOS BY JIM HATFIELD

Road Trip: Elkhart Lake, Wisconsin THE HAWK AT ROAD AMERICA

The nickname keeps changing. First, it was The BRIC (Brian Redman International Challenge), then it was the KIC (Kohler International Challenge) and this year it's The Hawk—named for performance and brake pads. Still, Brian Redman's participation remains constant.

By any name, it's the Midwest's own Midsummer Night's (and Day's) Dream, our biggest summer vintage racing weekend, held this year on July 13–15 at the lovely, green and hilly 4.048-mile Road America circuit. If you haven't been there, it's in Wisconsin, just south of the venerable resort village of Elkhart Lake. Besides a huge turnout of great racing cars, twin highlights every year are the Friday and Saturday evening

Concours(es) d'Elegance, held on the old road course right in front of Siebken's Hotel in downtown Elkhart Lake. On Friday night the race cars come roaring (or spluttering car-ly on loaded spark-plugs) into town from the racetrack, complete with police escort and total impunity, to be judged by the concours committee—and by R&T for the Car We'd Most Like to Race. And on Saturday evening it's the Sports Car Concours, for street-driven classics. Both evenings attract huge crowds, who are serviced by street-side outdoor bars noted (by me) for excellent margaritas. But not so many that we can't pick the R&T Car We'd Most Like to Drive Home. Maybe the following day.—Peter Egan

If you go, you must check out:

- 1 The several famous brat (pronounced "brott," not like your kids) stands in the paddock, featuring the famous Sheboygan bratwurst.
- 7 The Lola T-70 Can-Am Reunion Paddock, as well as FIA endurance cars such as the Ferrari 512s and Ford GT40s.
- 3 Race viewing from Turn 5 (demon late-braking, with many mistakes), Turn 6 (up-and-over drifting under the bridge), Turn 12 (cars run through a wooded valley right out of *The Hobbit*) and Turn 3 (downhill flow-and-drift through).
- 4 A chat with the great—yet very funny and personable—Brian Redman.
- 5 Especially not to be missed, my own Crossle vintage Formula Ford, if I ever get it put back together in time. Note the new mirrors and clutch release bearing...and Hawk brake pads!
- 6 Our *Road & Track* tent (see you there). Visit www.roadamerica.com for ticket info.



"When I was 4, I already knew what I wanted to be when I grew up. Faster."

-Ann Marie Wachel

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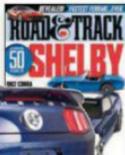
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YOUR TURN



How Much?

Sure, sure, I know what a Shelby Cobra goes for today ("Celebrating 50 Years of Shelby," Cover Story, May 2012). But the Shelby 1000? A \$150,000 Mustang? Seriously?

*Dr. Bernard Muszynski
Hinsdale, Illinois*

MIATA OR COBRA?: A friend of mine races a tweaked and banged-up 1964 AC Cobra and a Miata at SCCA events. The Miata has 100 less horsepower, but turns in nearly identical lap times.

*Frank Osuna
Albuquerque, New Mexico*



LOWDOWN ON

UPKEEP: What a great comparison between the Audi A7 3.0 TFSI and the Lexus GS 350 F Sport (Road Test Comparison, May 2012). The A7 won by a mere 18 points, or 0.31 percent, hardly a landslide. What your results should also consider are reliability and cost of ownership. Audis are not terribly reliable and have a horrendous cost of ownership, even for routine maintenance. Lexus is generally at the top of reliability statistics, and the cost of ownership matches Toyota's for routine scheduled maintenance. Please factor those into your analysis, or commentary, to balance the playing field.

*Richard Martin
Penn Valley, California*

BURNT OFFERINGS: I owned an Aston Martin "Carbon Edition" in 1988. Unfortunately, mine was the result of my 1966 DB6 Vantage catching fire. Having a carbon edition like mine wasn't as valuable back then.

*Bob Youmans
Tucson, Arizona*

OH, BARTENDER: Matt DeLorenzo's Road Ahead ("America" Festival of Speed," May 2012) brought back memories of the Indy 500 in the late '50s and early '60s. I begged my dad to let me listen to the race on the car radio at our cabin in the woods. I periodically updated him and my uncles on who was winning the race...and refilled their beers.

*Barry Leyman
Kennedy, New York*

SUBARU SAYS: I read with interest Mr. Mitani's article (Countersteer, May 2012) questioning why both the Subaru and Scion versions of our new sports car are being sold in the U.S. I can only imagine the cry from our performance fans, let alone our dealers, if we had elected not to bring to market a car that Subaru engineers had worked so hard to develop and that we

produce in our Gunma factory for both Subaru and Toyota brands. We feel we ought to provide a product that will make our existing loyal buyers happy and also attract new buyers into our dealerships. That's why we decided to bring the BRZ, such a great example of our engineering prowess, to the U.S. in full Subaru form.

*Michael McHale, Subaru of America
Cherry Hill, New Jersey*

IN YOUR FACE: The new Ferrari F12berlinetta looks like a raucous mess (Ampersand, May 2012). Was it designed by three or more designers, sort of like the Bangle BMW designs of the first half-decade of the 21st century? It makes me think of a very talented eighth-grader who, with about a decade of maturation, may learn to design one car at a time. What's happened to modern car design? Is every designer only



concerned with using shock value to attract eyes today and sacrificing classic styling that endures for decades?

*Allien Edelstein
Highland Park, New Jersey*

TEE TIME: Derek Daly makes some interesting points when he refers to the lack of American drivers being the downfall of Indy-style racing here in the United States (The Podium, May 2012). Both IndyCar and NASCAR have lost the core of their fans over the last 15 years not because of the loss of American drivers, but because of lack of innovation. Now the cars have the same engines and the same calibrated valves. I'd rather go play golf on a Sunday afternoon and read about the winner in the next day's paper.

*James D. Scharf
Salamanca, New York*

GRAND ADVENTURE: What a great story ("Sentimental Journey," May 2012). I owned an MG TF for over 40 years and always dreamed of an epic trip like the one the DeToursnays took. Thanks for devoting the space for a great story. T-series owners are the best.



*Ted Horning
Shawnee, Kansas*

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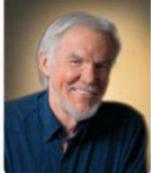
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SIDE GLANCES

BY PETER EGAN
EDITOR-AT-LARGE

A TDI Weekend at Sebring

WHAT A PERFECT FLORIDA EVENING. LAST GLOW of a tropical sunset fading behind palm trees rustling in a light breeze, and me pulling into Gate 2 at Sebring in a borrowed black Audi TT RS with red-stripped wheels. Racing cars were already out on the track for night practice, shrieking around the course like animals caught in a small room and wild to get out, yellow headlights slashing the warm dusty night. Exciting stuff.

Audi's Sarah Toycen met me at the registration building and had me follow her golf cart out to the motorhome at Turn 15 that would be my home for the next three days. Actually, there was a whole row of motorhomes, as Audi had invited most of the American press to witness what they hoped would be a 1-2-3 team triumph—and to attend the unveiling of their new R18 e-tron Quattro hybrid prototype and its non-hybrid lightweight sister car, the Ultra, soon to be run at Spa and Le Mans.

Barring bad-luck crashes or weird parts failures, no one seriously expected Audi to lose. It

promised to be more a command performance than a race: "Come and see the Rolling Stones in a fantastic Battle of the Bands! They'll be up against the Velvet-Tones from Hoboken!" That sort of thing.

I threw my suitcase into the motorhome and began walking down toward pit row to see what was shaking. All three Audi R18s were out there, hitting their automatic headlight flashers to warn slower traffic out of the way. And—as I would soon learn—almost everything was slower by at least a full second. Their main competition and last year's winners, the Peugeot team, were not there. Citing financial woes, Peugeot had abruptly pulled the plug on its entire endurance racing program in mid-January, with cars already at Sebring and drivers reportedly in mid-flight from Europe. Welcome to Florida. Now go home.

As I walked toward the pits, the track PA suddenly squawked that all three Audis had been involved in a spin/shunt passing accident on one of the corners. Yikes! And me having just arrived...



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I hotfooted it over to the Audi pits, but no one seemed terribly flustered. Crew chief Brad Kettler told me the damage to the cars was fairly light. "We have plenty of spares," he said, and assured me all the cars would be going back out before practice was over.

Plenty of spares, indeed. These cars are built like Lego toys, whole front and back ends ready to bolt up and go in only a few minutes. Quick disconnect fluid lines everywhere. Rows of new bodywork, ready to snap into place. And it was told that Team Audi Sport Joest brought 129 crew members to Sebring. These guys don't play to lose.

And, frankly, I didn't want them to. I'm usually averse to the effect an overdog team can have on racing, but Audi's protean ability to adapt to new restrictions and still triumph is one of the few things that keeps me—and a lot of other fans—interested in this side of the sport.

Outlaw Group B rallying? No problem. Audi proceeds to dominate the U.S. Trans-Am and IMSA GTO series, then puts away the Quattros and has Dr. Wolfgang Ullrich turn his attention to endurance racing. Le Mans-winning R8s too fast and dominant? Okay, we'll build a 5.5-liter R10 turbodiesel and win with that—which everybody says can't be done. Engine too big? We can win with a 3.7-liter TDI with better aerodynamics. Since 2000, Audi had won Sebring nine times and Le Mans 10, always pushing new technology. And, perhaps best of all, the cars are always beautiful. As Dr. Ullrich said in a recent interview, "Ugly cars have never been fast."

Now there's a rule of physics you probably don't hear much in engineering school. But you do strain yourself trying to think of an exception.

When the cars went back out for the last Thursday night session, I hiked down to the very fast Turn 1 for awhile. Much blatting and downshifting as most of the pack came through, but the Audis sounded like whistling death, soaring past visibly faster than the other cars in a rush and rustle of wind and tire noise. This lack of deafening engine racket is supposed to take something away from the experience, but I find it oddly thrilling in an unearthly sort of way, like being mugged by a ghost.



The cars emit shock waves more than noise. Maybe stealth is the new evil.

And the R18s do look evil, in the best possible sense. With those long stabilizing fins, podlike cockpits and lobster-claw front fenders, they somehow remind me of man-made sea monsters, like Captain Nemo's *Nautilus* from the Disney version of *Twenty Thousand Leagues Under the Sea*. Which, as a kid, I thought was one of the most captivating machines I'd ever seen. Purpose with style and a touch of malevolence.

When this night practice session was over, Audi didn't put the cars away. Instead they stayed in the pits and rehearsed quick driver changes. Audi before the R18 were all open cars so that valuable seconds could be saved during driver changes, but a revision of the tire change/air gun rules had mandated more time in the pits. Hence the enclosed cockpits.

On Friday came the unveiling of the new R18 e-tron Quattro in the Audi hospitality tent. Lovely thing, essentially a more aerodynamic and lighter R18 with a braking energy-recovery system built into the front axle. Braking energy is fed into an electric flywheel accumulator that sends energy back into the front axles at speeds above 74 mph (by regulation). The rear axle remains a conventional TDI setup, unconnected to the front.

The Ultra car is identical, but without the front axle wizardry. Both chassis are lighter because the Automobile Club de l'Ouest and FIA have tried to slow the Audis down by adding ballast and intake restrictors and reducing boost and fuel capacity. Their attempts to limit the Audis before have simply resulted in faster cars using a higher level of technology, so we'll see how it works at Spa and Le Mans this year.

In the meantime, the "old" R18s certainly worked well in their swan song appearance at Saturday's 60th running

"As Dr. Ullrich said
in a recent interview,
'Ugly cars have
never been fast.'"

of the Sebring 12-Hour.

To cut to the chase, they finished 1st and 2nd overall, 4 laps ahead of the field. The No. 1 car had trouble with an electric shifter servo and finished well down after several long pitstops. The winning car was

driven across the line by Allan McNish, who co-drove with Tom Kristensen and Dindo Capello. (I later had a chance to sit with McNish at the victory dinner and found him to be a lively, funny guy of great intelligence and insight. And, like most proper gentlemen, a former dirt bike, kart and Formula Ford racer. Now I feel a personal obligation to root for him at Le Mans.) The GT race was a door-banging cliffhanger, however, ending with a BMW M3, a Corvette and a Ferrari 458 Italia only seconds apart.

After the race, I wandered over to the winner's circle and watched the jubilant Team Audi Sport Joest take their trophies. After that, there were so many classes and hat-changes for photos that even the half-drunk St. Patrick's Day fans from the infield began to drift off, glassy-eyed with confusion. I did too.

Walking back to the motorhome after the long day, I could feel my arteries suddenly starting to unclog, so I stopped at a food booth advertising "Stuffed Pizza and Stromboli," and ate what was probably the last slice of pizza in Sebring. Almost still partially warm.

Properly stuffed, I went back to the motorhome and was lulled to sleep by the chorus of generators, amid sprawling acres of race cars, transporters, paddock lights, stuttering air tools, golf carts and air conditioned hospitality suites. It felt like the very vortex of the world's energy drain. And yet Audi was using this series to test fuel-efficient turbodiesels, lightweight materials and, now, a new hybrid with energy recovery in the front axle.

Redemptive or not, I do love living in an era where this kind of technology really does make it from the racetrack to the showroom, a time when fun and laser-like speed can be had without just bolting on another huge 4-barrel carburetor. Sometimes the past is right where it belongs.



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COUNTER STEER

BY SAM MITANI
INTERNATIONAL EDITOR

"Everyone from local police officers to undercover agents was skeptical about the changes, that is, until they drove the car."

A New Police Car for the Times

THERE'S REALLY NOTHING LIKE GETTING HOME from work, pouring yourself a drink, turning on the television and watching a live police-car pursuit on the local news. In Los Angeles, this type of programming airs more often than a new episode of *Mad Men*. On one particular evening, it was a Mercedes-Benz E-Class, obviously stolen, trying to shake several police cars in pursuit. The cops were in old Ford Crown Victorias, which made me think, why don't the police upgrade their vehicles to something that can safely keep pace with today's sportier cars?

So I made a call to a Ford representative about this point, and he said to me: "Good timing. We're having a test drive of the new Ford Interceptor next week. I'll put you on the invite list."

At the event, I spoke to a few retired police officers, and they seemed a bit sad to see the Crown Victoria Police Interceptors go. After all, it had served them for 20 years. Throughout its entire life, the Crown Vic was the standard vehicle for law enforcement agencies everywhere, comprising 70 percent of total market share. So how do you replace an entity whose legendary status is right up there with notable law-enforcement icons such as Dirty Harry and Colombo? Instead of simply re-creating another Crown Victoria-like vehicle, Ford wiped the slate clean and built something entirely different. A few things that the engineering team proposed, however, had some cops reaching for their handcuffs.

First, Ford engineers opted to replace the Crown Vic's big-block V-8 with a V-6 (a misdemeanor). Then they took away rear-wheel drive, replacing it with all-wheel drive and, gasp, front-wheel drive (a felony). Everyone from local police officers to undercover agents was skeptical about the changes, that is, until they drove the car.

Up close, the new Ford Police Interceptor, based on the Ford Taurus, looks mean. It's more compact

and curvaceous than the car it replaces. Under the hood is the aforementioned V-6 that produces 288 bhp and 254 lb.-ft. of torque, which is 38 more bhp than the Crown Vic's V-8. Power is sent to all four tires via a specially tuned automatic transmission. There's a high-performance front-drive version equipped with a turbocharged 3.5-liter V-6 that pumps out a whopping 365 bhp and 350 lb.-ft. of torque. And because of the car's more powerful engine, the new Interceptor sedan feels like a rocket. (There's a new SUV Interceptor, too, based on the Ford Explorer.)

The suspension has been tuned for better cornering prowess, and the brakes have been heavily upgraded. On a small autocross course, the new Interceptor was impressive. Our test car was the all-wheel-drive model, and it felt so composed and neutral on the tight course that it reminded me of a friend's autocross race car. The steering was quick and there was minimal body roll. The car accelerated briskly, and the special gearbox kept the car in low gears when other transmissions would upshift (very important when coming out of corners). In comparison, the Crown Victoria was all over the place and felt like a dinosaur.

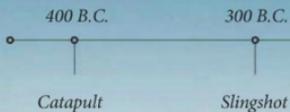
The new Interceptor can be ordered with bulletproof doors ("It'll stop shots from an AK-47," one fellow said) and comes with special seats designed to accommodate an officer's utility belt and holstered gun. My big gripe here was that these seats lack lateral support, but they do include a stab-proof panel in the seatback, a worthwhile tradeoff.

Perhaps the best thing about the new Ford Interceptor is that it's economical (20 percent better fuel economy than the Crown Vic) and comfortable (I could easily chase someone cross country). Yet it's as fast as many sports cars, so anyone thinking of trying to outrun one should probably reconsider. The Ford Interceptor is available only to government agencies, so none of us without badges can ever buy one.

As for that Mercedes-Benz on the run, the police spun it out via the PIT maneuver after a six-hour chase...but with these new Ford Police Interceptors, I'm sure it would have ended much earlier.



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2013

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Drives

- ▶ ASTON MARTIN V8 VANTAGE ROADSTER VS PORSCHE 911 CARRERA S CABRIOLET
- ▶ MERCEDES-BENZ CL63 AMG
- ▶ FORD MUSTANG GT
- ▶ DODGE DART
- ▶ VOLKSWAGEN BEETLE TDI
- ▶ TOYOTA PRIUS C

JULY 2012

ASTON MARTIN V8 VANTAGE ROADSTER





SUNSHINE AND SPEED



Getting air in two ultra-quick, exclusive drop-tops

SELF-INDULGENCE, YOUR convertibles have arrived. Porsche's 911 Carrera S Cabriolet is slick, its power top essentially a hard, Z-fold endoskeleton sheathed with fabric that yields a smooth, almost Speedster-like roofline. The Aston Martin V8 Vantage Roadster is, as British design dictates, more traditional, its bowed top stowing electrohydraulically beneath an articulated cover that incorporates leather-wrapped headrest fairings. For a drive that assaulted our senses and follicles alike, Managing Editor Andrew Bornhop and I grabbed the

keys and set off on a 400-mile trek that involved ridge-running into Big Bear's mile-high, pine-redolent air, then descending north to the magnificent desolation of a sunbaked lake bed in Lucerne Valley.

The Porsche is a precision instrument, its 400-hp flat-6 barking in response to the slightest tickle of the throttle, its PDK Doppel-clutch 7-speed automatically blipping and downshifting brilliantly, as if a tiny Hurley Haywood were inside personally changing the gears. There's phenomenal grip—1.02g—those forces fed through aluminum suspension

to a steel unibody whose snaredrum tautness faithfully communicates every nuance in the road, a perfect complement to the feedback-rich steering. Although its acceleration doesn't quite match the Carrera S Coupe we tested (February 2012), it's still bloody quick: 3.8 seconds to 60 mph and 12.1 sec. in the quarter mile, both figures 0.3 sec. arrears of the fixed-roof car.

There's a firmness, a seriousness to everything you touch inside, from the bear hug of the sports seats to the regimented detents of the gear selector. The ride itself sug-

gests athletic ability even in normal mode, and selecting Sport or Sport+ settings requires both renal fortitude and a road worth attacking. We're a bit put off, though, by the high center console and the high level of clutter and switchgear fussiness in the 911's interior. True, the bones of 911 DNA are there (basic dash architecture, 5-dial instrument cluster, "key" on the left), but some of the honesty and openness of past 911s has been sacrificed on the altar of technology.

That said, there's a specialness here unmatched by any other car, in the tightly wound



VS. PORSCHE 911 CARRERA S CABRIOLET



PHOTOS BY BARRY HATHAWAY

flat-6 gnashing behind your back, the slight bobbing ride motions felt up front that come from such a rear-biased weight distribution, the way that the front tires don't just succumb to understeer at the limit... they seem to actively reach out and locate that extra bit of grip.

The Aston? If the 911's a whipper, the Aston is a bulldog... shorter, squatter, fitted with a dry-sump 420-bhp 4.7-liter V-8 transferring power to a rear-mounted 7-speed transaxle via a carbon-fiber driveshaft. Our car had the "Carbon Fibre Bodypack" option, whose deep front splitter and gorgeous rear fascia/valance impart the look of the more powerful Vantage S.

This bulldog has impeccable manners, though. For 2012, the V8 Vantage gets bigger brakes (15.0-in. front rotors and 6-piston calipers), a quicker 15.0:1 steering ratio and 10-mm-wider tires. The Roadster has negli-

gible body roll, a wonderful, locked-down cornering feel and is confident in transitions, although at 0.94g it can't match the Porsche's ultimate grip. Its biggest dynamic shortcoming is the Graziano-supplied 7-speed Sportshift II transmission, a paddle-shift single-clutch gearbox that, while delivering perfectly snappy shifts near redline, is annoyingly clunky and rather languid when simply cruising around. At the track, with its exhaust bypass uncorking the V-8's gloriously blatty note, the Roadster clicked off a 4.5-sec. 0-60 run and posted a 12.9-sec. quarter mile.

Peruse the data and you'll see that the Aston, while a seriously good performer, takes a back seat to the Porsche in every performance contest. But you'd be missing the point judging this Brit solely by the numbers. Inside, instead of hard-edged German angst,

you're coddled with warm, Old School British craftsmanship. The seats cradle with comfortable support, the adjusters on the sides of the center console. The aroma of leather is strong, the fat

contrasting stitching is tactile as well as visual, and the detail work is just amazing. Take the Alcantara-lined A-pillars and windshield header, for example. Its just-so sun visors have exquisite metal-trimmed vanity mirrors, and are attached with fittings that would make a watchmaker proud. The ignition key? A crystal-looking affair that fits in a slot at the top of the piano-black center stack. The flyaway handbrake between the seat and the sill

is another enticing element, a leather-wrapped drumstick with a polished handle. The 911's plastic pushbutton equivalent is clinical by comparison.

It's really horses for courses with the Aston and Porsche, the former a bit more dignified and stately, the latter the uncontested performance champ. Each is exciting in its own way, each a coveted machine to have when the sun shines and your favorite two-lane beckons. —Douglas Kotz

	2012 Aston Martin V8 Vantage Roadster	2012 Porsche 911 Carrera S Cabrio
List price	\$138,120	\$108,000
Price as tested	\$147,595	\$140,375
Curb weight	3845 lb	3540 lb
Weight dist	48/52	38/62
Layout	front engine/rear drive	rear engine/rear drive
Engine	4.7-liter dohc 32V V-8	3.8-liter dohc 24V F-6
Transmission	7-sp paddle-shift manual	7-sp paddle-shift manual
Horsepower	420 bhp @ 7300 rpm	400 bhp @ 7400 rpm
Torque	346 lb-ft @ 5000 rpm	325 lb-ft @ 5600 rpm
Tires	Bridgestone Potenza RE050A; 245/40ZR-19 t, 285/35ZR-19 r	Pirelli P Zero; 245/35ZR-20 t, 295/30ZR-20 r
0-60 mph	4.5 sec	3.8 sec
0-100 mph	10.5 sec	9.0 sec
0-1320 ft (1/4 mile)	12.9 sec @ 111.5 mph	12.1 sec @ 116.9 mph
Top speed	180 mph	186 mph
Braking, 60-0 mph	126 ft	112 ft
Braking, 80-0 mph	215 ft	194 ft
Skidpad	0.94g	1.02g
Sloam	69.1 mph	71.3 mph
Our mileage	14.3 mpg	16.1 mpg
EPA city/hwy	14/21 mpg	19/27 mpg



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■ The Porsche? It's precise and rewarding, but a little clinical, the Aston, a rorty exercise in Old World craftsmanship. Aston's V-8 is set well back beneath an elliptical-section shock tower brace, whereas the presence of the 911's flat-6 is only hinted at by the twin cooling fans and air intake.





WorldMag

MERCEDES-BENZ CL63 AMG

Gizmos galore,
plus stupendous
performance

List price	\$151,500
Price as tested	\$158,800
Curb weight	4895 lb
Engine	5.5-liter twin-turbo dohc 32V V-8
Transmission	7-sp automatic
Horsepower	563 bhp @ 5500 rpm
Torque	663 lb-ft @ 2000–4500 rpm
0-60 mph	3.9 sec
0-100 mph	8.7 sec
0-1320 ft (1/4 mile)	12.1 sec @ 119.7 mph
Braking, 60-0 mph	126 ft
Braking, 80-0 mph	217 ft
Skidpad	0.92g
Slalom	68.0 mph
City mileage	est 17 mpg
EPA city/hwy	15/22 mpg

0-60 MPH
3.9
SEC

0-1/4 MILE
12.1
SEC

TOP SPEED
186
MPH

SKIDPAD
0.92
G

SLALOM
68.0
MPH

R&T TESTED

The \$151,500 Mercedes-Benz CL63 AMG is a difficult car to assess. It contains enough features to occupy a month's worth of customization. You'll get to optimize everything from Active Multicontour Seats With Massage (personal choice: Off) to Multicolor Ambient Cabin Lighting (personal choice: Off) to Active Lane Keeping Assist (personal choice: Off).

Are you perhaps sensing a trend here?

Yet the CL63 AMG also has stupendous perform-

ance: Our track lads saw 60 mph arrive in a mere 3.9 seconds, the quarter mile in 12.1 sec. at 119.7 mph. Skidpad and slalom evaluations also yielded numbers particularly impressive for this luxurious—and at 4895 lb., hefty—coupe: 0.92g and 68.0 mph, respectively.

Paradoxically, the CL63 AMG also has Mercedes' Eco Start/Stop, one of the best conventional starter/battery systems in terms of its transparency of operation. Indeed, I left this feature On.

All told, the car's fuel economy improves by some 16 percent compared with its predecessor's. Officially, the EPA rates the new one at 15/22, city/highway mpg, respectively. I suspect what's more satisfying to an owner is the coolest burble made by the potent V-8 on restart.

Reflecting these Eco times, the car's CL63 moniker is rather an exaggeration: Its standard engine is a twin-turbo displacing 5.5 liters, yet producing 536 bhp at 5500 rpm; torque is 590 lb.-ft. from

2000 to 4500 rpm. As if this weren't sufficient, our test car came with the \$7300 AMG Performance Package that enhanced things to 563 bhp and 663 lb.-ft. of torque. Holy gizmos!—Dennis Simanaitis

2013 FORD MUSTANG GT

Not totally new, but completely improved

THE LATEST S197-SERIES Mustang, and possibly the last refresh we'll see, receives changes and packages that invite owners to build their own perfect Mustang.

To start, all Mustangs get the GT500's front fascia, while rocker panels are now color-matched. New LED taillights and colored trim pieces give the Mustang's backside a tuned look. On the inside, optional Recaro bucket seats can be had in either cloth or leather.

Manual-transmission Mustangs get hill-hold to prevent excessive roll-back, while owners of automatic models will finally be able to change gears themselves, thanks to a gear-selector toggle located on the shifter.

Enthusiasts who opt for the GT will notice some other changes. Trickle-down tech from the Boss 302 raises the power to 420 bhp and provides 3-mode power-assisted steering.

Both GT and standard models will be available with two

packages that track and sport enthusiasts will want to check.

First off is the Brembo package that's comprised of 14.0-in. brake rotors as well as larger summer tires mounted on 19-in. wheels. For buyers of manual-transmission GTs, Ford has announced the GT Track Pack. As the name denotes, parts that come with

this package emphasize track usage and include the Boss 302's 3.73:1 Torsen differential, oil cooler, a more efficient radiator, more aggressive brake pads and the same wheels, tires and rotors found in the Brembo package.

We're looking forward to testing a GT Track Pack-equipped GT with leather Recaro seats.—Calvin Kim



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2013 DODGE DART

Detroit iron from Italian ingot

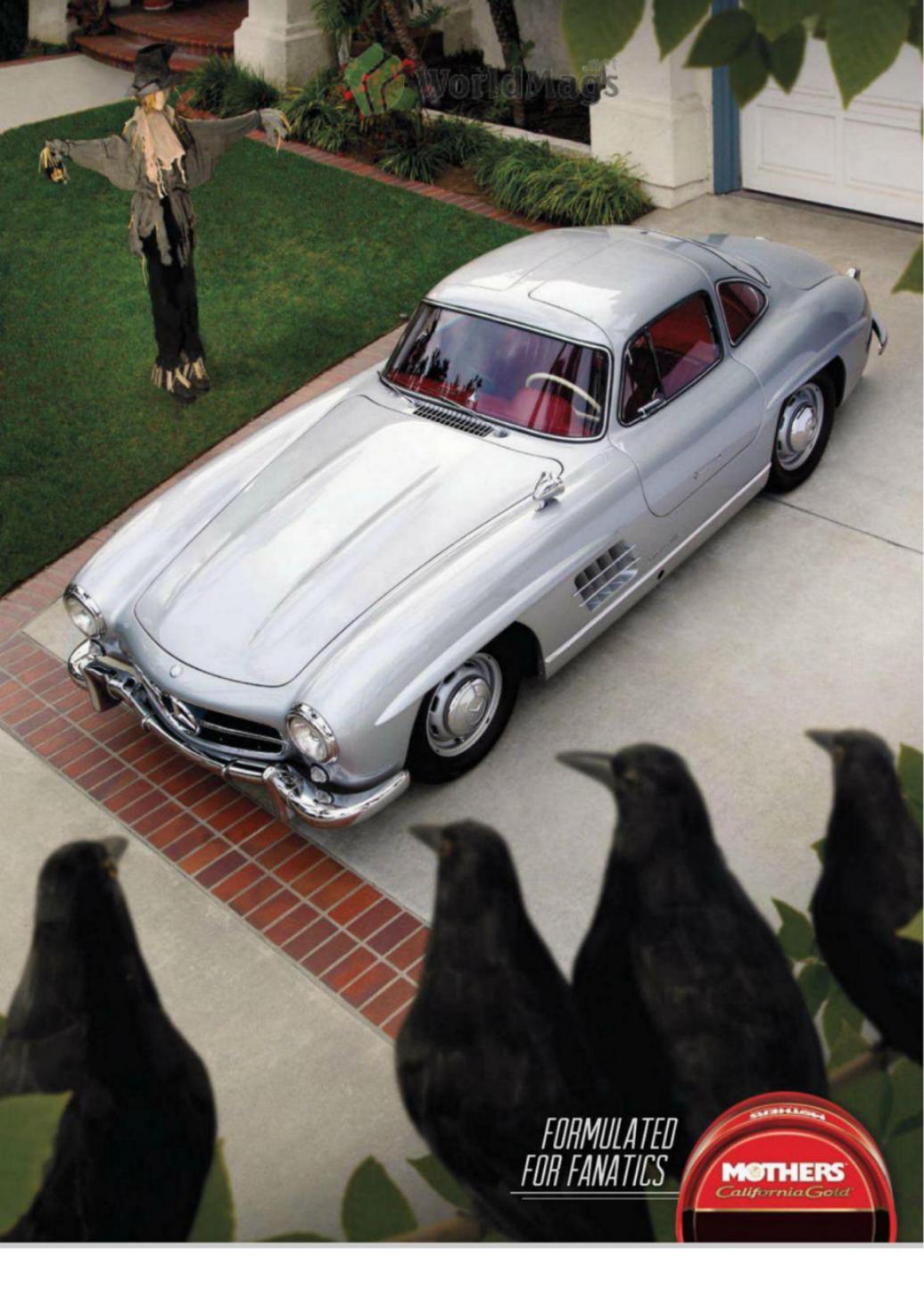
THE NEW DART IS AN ITERATION OF THE Alfa Romeo Giulietta, and that's a good thing. This Italian-American follows in the footsteps of the Neon, even being built at the same Belvidere, Illinois, assembly plant. As the compact sedan is slightly larger than its competitors, the Dart displays performance that matches its youthful, albeit retro name. Consistent with the new 300, its interior is several notches above past Dodge products. Thankfully, it's not all about the touchy-feely stuff, as engineers worked to improve the Italian platform for U.S. consumers. Some of the gains were achieved with massive die-cast aluminum subframes that are bolted directly to the chassis for precision response and light weight. We particularly like this little front-drive sedan in Rallye trim with the optional turbocharged 164-hp 1.4-liter MultiAir engine and 6-speed manual transmission. It's a

blast to drive, thanks to 184 lb.-ft. of torque that comes on low and strong in the rev range, yet also manages 27/39 mpg. The biggest surprise in driving the Dart is, well, driving it. Anyone with an ounce of vigor in their bones will appreciate it. The base engine is the Tigershark 2.0-liter four with 145 bhp, which most will pair with the conventional 6-speed automatic or a forthcoming dual-clutch transmission. Buyers will appreciate the roominess, unique under-seat storage and massive glovebox, while enthusiasts will dig the TFT instrument cluster borrowed from the new Viper, and the soon-to-come R/T version with a 184-hp 2.4-liter engine. With an entry price of just under \$16,000 and a nicely equipped Rallye starting under \$20,000 with the optional 1.4 turbo, this Italian-American should be proud.—Shaun Bailey

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2013 VOLKSWAGEN BEETLE TDI

From 1998 to 2006, the New Beetle could be had with a 1.9-liter inline-4 turbodiesel, but back then, gasoline prices were relatively low so the diesel-powered Beetle failed to gain popularity. But today, this car makes more sense so VW has brought it back into the lineup.

The Beetle TDI's powerplant is a 2.0-liter turbocharged clean diesel that produces 140 bhp at 4000 rpm and 236 lb.-ft. of torque at 1750. It comes mated to either a 6-speed manual gearbox or a DSG semi-automatic transmission.

It gets 29/39 mpg city/highway.

The front-drive car leaves the line well, so instantaneous is its torque. And the acceleration continues all the way into the



0-60 MPH
10.6
SEC

0-1/4 MILE
17.8
SEC

TOP SPEED
105
MPH

SKIDPAD
0.81
G

SLALOM
64.1
MPH

R&T TESTED



PHOTO BY BRIAN BLACES

TOYOTA PRIUS C

**40 mpg—a real 40 mpg,
without the highway hype**

SEEMINGLY, EVERY CAR and its dog gets 40 mpg today—but beware the whispered “on the highway.” Our recent experience with Toyota’s Prius c recorded an honest 40.3-mpg average—this, in our probably aggressive driving as each staff member wrings out the car for the first time. Only after the first few stints do we AARP types start posting averages in the 50s, not to

say a TFT Multi-Information Display-documented 79.9 mpg on one stint.

Full disclosure: A goodly amount of this 79.9 mpg was cruising a tourist-thronged (and -thonged) Huntington Beach Main Street one busy Sunday afternoon. The c performed part of this in pure EV, a mode that’s more easily invoked and maintained than in previous Prii.

Our road test numbers give a proper enthusiast’s perspective to fill out the c’s admirable EPA 54/46/50 City/Highway/Combined mpg. The car got to 60 mph in 10.6 seconds and posted quarter-mile results of 17.8 sec. at 76.9 mph. Nothing to get the blood boiling, to be sure; but not a traffic-impeding slug either. A skidpad of 0.81g and slalom of



high rev ranges. The suspension consists of struts up front and a torsion beam at the rear. Look for the Beetle TDI to make an appearance this summer for about \$25,000. —*Sam Mitani*

MORE ONLINE roadandtrack.com/VWTDI

List price	\$23,230
Price as tested	\$24,380
Curb weight	2635 lb
Engine	1.5-liter dohc 16V inline-4/electric motor
Transmission	CVT
Horsepower	99hp (combined)
Torque	207 lb-ft (combined)
0-60 mph	10.6 sec
0-1320 ft (1/4 mile)	17.8 sec @ 76.9 mph
Braking, 60-0 mph	128 ft
Braking, 80-0 mph	321 ft
Skidpad	0.81g
Slalom	64.1 mph
Our mileage	40.3 mpg
EPA city/hwy	54/66 mpg

64.1 mph are perhaps better indicators of the car bringing much of its Toyota Yaris-based dynamics into the world of hybrids. In fact, this is the car's niche: a roomy economical compact that doesn't scream "Look at me! I'm Hybrid!"

The Prius's price extends through four different models, named with full Toyota candor Prius c One (\$18,950), Two (\$19,900), Three (\$21,635) and Four (\$23,230). Our Four included standard SofTex front seating, nav and Entune smartphone linkup and added sunroof, P195/50R-16 tires and a few other spiffs; its out-the-door price, \$24,380. —*DS*

MORE ONLINE roadandtrack.com/PriusC

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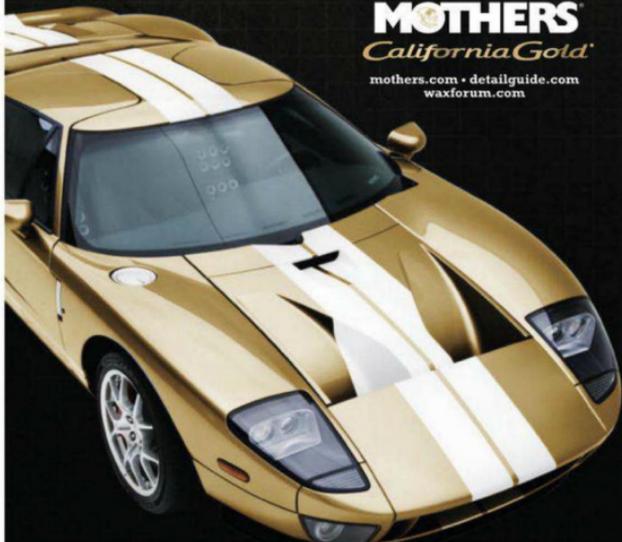
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What Matters to You?

Today, America needs fresh leadership to lead us as a nation out of this economic crisis. Leadership must come not only from our political leaders but also from the average citizen. The exporting of American jobs is a trend that must be stopped and reversed. When I walk into my local hardware store, I typically find 85% of the goods for sale are manufactured 7,000 miles away. Recognizable American brands have been forced by shortsighted management and buyers at large national chains to build factories overseas just to save a lousy \$.50 on a tape measure. To these ruthless buyers, it is all about the money. Rarely are product quality, the political system, human rights, animal rights and environmental costs to the planet considered, not to mention the cost to our society of exporting not only jobs, but an entire factory!

At MacNeil Automotive, we are doing our part for the American economy and for our 300 million fellow citizens and neighbors. My philosophy is that if my neighbor doesn't have a job, sooner or later I won't have a job either. For example, we used to have our All-Weather Floor Mats manufactured in England by a company that used antiquated, inefficient equipment. They made a decent floor mat for us, but we thought we could build a better floor mat for our customers using modern American technology, American raw materials and skilled American workers. So in 2007 we transferred all of our floor mat manufacturing back to the United States. Today, we build the best fitting, highest quality automotive floor mats in the world, right here in America.

Our machine shop is equipped with 17 CNC machining centers including four 4 axis mills and one 5 axis mill that produce between 30 to 50 injection and thermoforming molds per month. We have one shift of highly skilled American Journeymen toolmakers and apprentices, but our machines run 24 hours a day, 7 days a week. There is not a more efficient tool and mold making operation in the world - and guess what, it's right here in America. →





David MacNeil
Founder/CEO

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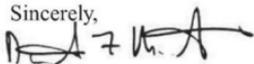
Furthermore, all of our CNC mills are manufactured in Oxnard, CA by Haas. Our 1,000 ton injection molding machines are made in Bolton, Ontario of American and Canadian components. Our thermoforming machinery is made in Carol Stream, IL. The raw steel and aluminum billets which make up our tooling are sourced from American steel and aluminum mills such as Vista Metals in Fontana, CA. The raw materials that make up our All-Weather Floor Mats, FloorLiners, Cargo Liners and Mud Flaps are manufactured in Bellevue OH, Arlington TX, Wichita KS and Jasper TN. Our forklifts are made in Columbus IN and Greene NY. Our warehouse racking is manufactured in Tatamy PA.

At MacNeil Automotive, we are also very aware of sustainability and our responsibility to the environment. We are proactive in controlling waste and recycling all of the unused raw materials from the manufacture of our tooling and products including: aluminum, steel, rubber, TPO, TPE, paper and cardboard.

As you can see, we are as dedicated to designing, developing and manufacturing the finest automotive accessories for our consumer and OEM clients as we are passionate about supporting the American economy, preserving the American industrial infrastructure, and keeping the "money" in our family, a family of 300 million people from all over America.

Life is simple; be good to your fellow man, be kind to animals and the environment, and place building a quality product, supporting your country and your fellow American worker before profit. And, one last thing - let's all do our best to balance family time with work time as our children are the future of America.

Sincerely,



David MacNeil, Founder/CEO



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Fret not, supercar fans. In the face of higher fuel economy standards and stricter emissions rules, the idea of fast, fun and fantastic 4-wheel fantasies is not dead. As these five concepts show, automakers are working overtime to blend efficient technology with stunning bodywork and outstanding dynamics.

The future beckons. —Matt DeLorenzo



JAGUAR EX16

Building a better F-Type

PHOTOS BY JAMES ARBUCKLE

THE BACK STORY

Jaguar has long toyed with the idea of a lighter, 2-place sports car that would be positioned below its more GT-oriented XK (which succeeded the XK8) and the decidedly softer XJS). As far back as 2000, Jag introduced a front-engine rear-drive F-Type concept with swoopy, feline-inspired bodywork that featured a front-mounted V-6 from the X-Type sedan driving the rear wheels. Another idea kicking around was using the same components mounted amidships to rival the Porsche Boxster/Cayman.

Last fall, Jaguar introduced the C-X16 at the Frankfurt Motor Show. Unlike the 2000 concept, the car has a muscular shape in line with the current generation XK, XF and XJ models, avoiding the softer, curvy





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The All-New Nissan Altima coming Summer 2012

*2013 projected EPA estimate of 38 MPG highway for Altima 2.5S. Actual mileage may vary with driving conditions – use for comparison only. Always wear your seat belt, and please don't drink and drive. ©2012 Nissan North America, Inc.



retro-inspired lines that were earlier used to recall the E-Type. The only feature on the car to pay tribute to that earlier Jag was the side-hinged rear hatch, which we're told will not make it into production.

WHAT MAKES IT UNIQUE: The C-X16 concept, which rides on a 103-in. wheelbase and measures 175 in. overall, emphasizes light weight (the curb weight is listed as 3527 lb.) and hybrid power as a means to extract high performance. It makes use of aluminum-intensive construction and mates a supercharged 3.0-liter V-6 delivering 375 bhp and 332 lb.-ft. of torque to an 8-speed transmission.

Augmenting this powertrain is an electric motor, which delivers an additional 90 hp and 235 lb.-ft. of torque for 10 seconds through a "push to pass" kinetic energy recovery system (KERS), which is similar to what's used in Formula 1. Jaguar says the concept powertrain is good for 0-62 mph in 4.4 sec. and has an electronically limited top speed of 186 mph.

PRODUCTION PROSPECTS: Jaguar has announced that it will launch the F-Type 2-seater in 2013 with a design that is based on the C-X16. The big difference is that the car will be a roadster instead of a coupe. The closed car will follow at a later, unspecified date. The F-Type gives Jaguar a much-needed fourth model to rival the likes of the Porsche 911 and Lotus Evra. It will be powered by a new supercharged 380 bhp V-6; rumors have a V-8 coming later.



"JAGUAR HAS ANNOUNCED THAT IT WILL LAUNCH THE F-TYPE 2-SEATER IN 2013 WITH A DESIGN THAT IS BASED ON THE C-X16."

Purity of form drives the design approach behind the new F-Type's muscular shape.



WHAT'S NEXT: While the F-Type adds a pure sports car to the mix, that doesn't mean Jaguar has given up on the idea of a supercar. The gas turbine and electric hybrid C-X75 shown at Paris in 2010 is still under development. That car, in the mold of the legendary XJ220, could be in production by mid-decade.

MORE ONLINE roadandtrack.com/f1type

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51



ACURA NSX

A legend returns

PHOTOS BY RENATO ZACCHIA

THE BACK STORY:

Acura single-handedly rewrote the book on what exotic 2-seat sports cars should be when it introduced the NSX in 1990. Its lightweight aluminum construction and VTEC-equipped V-6 power were considered revolutionary at a time when similar mid-engine cars from Italy boasted V-8 and V-12 engines. Above all, the NSX was far easier to drive, much more dependable and didn't require expensive maintenance. Aside from slight cosmetic changes and engine upgrades, the NSX enjoyed a pretty good run, ending production in 2005. That's where the story gets interesting. Internal debates within Acura's parent Honda raged on whether or not to build a V-8 or V-10 to reflect the company's efforts in Formula 1. In 2007, it was announced that there would be a



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new V-10-powered NSX by 2010, but a year later then chairman Takeo Fukai cancelled it along with the F1 program, citing the poor economy. His successor, Takanobu Ito, revived the project and the NSX concept made its debut in January at the North American International Auto Show.

"ACURA HAS ANNOUNCED THAT THE NEW NSX WILL GO ON SALE IN 2014 AND, IN A NOVEL TWIST, WILL ACTUALLY BE BUILT IN AMERICA."



WHAT MAKES IT UNIQUE: Instead of being powered by a conventional V-10 engine, the NSX goes back to its roots in a way with a mid-mounted 3.5-liter V-6 driving the rear wheels through a 7-speed dual-clutch transmission. The difference this time around is that it will also use hybrid technology to drive the front wheels and the system is essentially the latest generation of the company's Super Handling All Wheel Drive that will be found on Acura sedans, but turned

around to have the front axle driven by two electric motors mounted inboard in a single housing. By using torque vectoring, the NSX should have razor sharp turn-in. The V-6 is said to produce about 310 bhp, while the motors, which use a lithium-ion battery pack, generate an extra 100 hp for combined output of more than 400 hp. That should be good for 0-60 mph acceleration of about 3.0 sec. Like the original NSX, the new model will also use aluminum-intensive construction. Its footprint is tidy, riding on a 101.4-in. wheelbase and measuring 170.5 in. overall, while standing just 45.7 in. high and is 74.6 in. wide. The concept has 19 x 9-in. front and 20 x 10-in. rear wheels shod, respectively, with 255/35R-19 and 275/30R-20 tires.

PRODUCTION PLANS: Acura has announced that the new NSX will go on sale in 2014 and, in a novel twist, will actually be built in America, at a facility in Ohio as a way of offsetting the high value of the Japanese yen. Still, the NSX promises to be pricey, with a sticker upward of \$100,000.

Expect few changes from the concept, mainly tweaks to front and rear fascias.



WHAT'S NEXT: The return of the NSX means that both Honda and Acura are getting back in touch with their enthusiast roots and perhaps more sports cars are coming with an eco bent. At last fall's Tokyo Motor Show, Honda displayed the EV-STER, a pure electric 2-seater that could fill a void in the lineup left by the late S2000.

MORE ONLINE roadandtrack.com/AcuraNSX

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PHOTO ILLUSTRATION BY CHRIS DOANE

BMW i8

Fast forward

PHOTOS BY RENATO ZACCHIA

THE BACK STORY: In response to a voluntary effort by European manufacturers to reduce CO₂ emissions, BMW has taken a two-prong approach to not only boosting the fuel economy of its regular production cars, but also by creating a new range of vehicles that takes advantage of the latest advances in hybrid and electric technology. The i lineup includes a small pure electric city car called the i3 and a more luxury-oriented 4-place GT called the i8. BMW first presented the i8 concept as the Vision EfficientDynamics Concept at the 2009 Frankfurt Motor Show. The Vision concept features a glass nose-to-tail roof and glass butterfly-opening doors. Hybrid power comes from two electric motors, one front, one rear, while the rear axle also gets an extra boost from a 3-cylinder turbodiesel and 6-speed dual-clutch transmission. BMW has since refined the idea and has





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RECEIVED BY EMAIL

V1 56Z:

"*LONG RANGER ONCOMING.*"

Hello Mr. Valentine:

Here's how much I trust my V1. Two beeps and I go Condition Red.

I was on 98 through Florida's panhandle. Only a two laner but the swath it cuts through Tyndall AFB is wide enough for a freeway, a broad ribbon of grass without interruption for a dozen miles, flat as the nearby Gulf of Mexico. A car pulled off the pavement is visible for miles, heh, heh, which means the speed nazis have no place to hide. So they adapt.

V1 gave me two beeps, weak ones, arrow pointing ahead. Then silence.

A few more beeps, arrow ahead, a singleton on the Bogey Counter. Then nothing. Traffic was light, only two cars in sight, one a half-mile ahead, another just a red speck in the distance. And a semi concerning just my side of the speck.

More beeps, getting stronger, arrow still forward. The car ahead looked about even with the semi. A two-beep warning, by itself, isn't much to go on, but V1 tells me more—one Bogey ahead, strengthening as I go, says "lone ranger coming at me." So I locked the cruise on a legal 60 and waited.

Just as I met the 18-wheeler, "Beeeeeeeeeeeeeep!" And there he was, a Florida black-and-tan tucked in tight behind the semi trailer where oncoming cars couldn't see him, holding his instant-on till I was too close to defend. It's a wicked trap, but V1 had him every time he zapped the cars ahead.

All I had to do is trust V1. How can you not trust a detector that points to the trap?

Mick D. (identity protected)
Tallahassee, FL

RECEIVED BY EMAIL

V1 56Z: "*DON'T BELIEVE IT'S JUST A TRAILER!!*"

Hey Mike:

I gotta tell you about the Blue-Light Special that V1 found for me. It was Saturday morning and I was in my grins car heading to her house to pick up Danny boy for the day. Heck yes, I took the ridge route.

This road was all fun back before the rock slide. Now it's interrupted by a 25-mph construction zone and a "your speed is" trailer.

No workers today, of course, but the trailer still woke V1 up. As I braked, a string of crotch rockets zoomed large in my rearview, five of them, right on my butt as I passed the trailer.

V1's WARNING OF A NEW BOGEY. "De-deet," said V1. Then "de-deet" again. And another "de-deet." The Counter showed four signals where I normally see one. One arrow pointed behind to the trailer as usual, but that leaves three in the wild. The flashing arrow points ahead.

We'd barely cleared the zone when the rockets blew by me, exhausts shrieking, the bikes laid over for the uphill left hander. They vanished over the crest. Me, I just moseyed, eyes out for three jokers. Just over the hill—Bingo!—a sheriff SUV hidden in the bushes. That's joker no. 1. Two more somewhere.

At that point the view opens as the road sweeps right over the valley. And maybe a half-mile ahead, light bars strobing blue, jokers no. 2 and 3 angled across the road, blocking five bikers still astride their motionless sickles.

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"THE BMW i8 WILL BE ON THE ROAD IN LESS THAN TWO YEARS."



presented a second i8 concept that is closer to the final production version. The radically styled Vision concept was the ultimate expression of the flame-surfacing approach to styling championed by former design chief Chris Bangle.



WHAT MAKES IT UNIQUE: The futuristic shape of the i8 is its chief calling card. The flowing lines and flame surfacing are unlike anything out on the road today, so it should stand out even in toned-down production trim. The large butterfly-opening doors provide access to both the front and rear seats, and the Vision concept's hybrid powertrain has been retained with the exception of a conventional gasoline-powered 3-cylinder engine in place of the turbodiesel. BMW says the combined output of the powertrain will enable a top speed of 155 mph and 0–62 mph acceleration of less than 5 sec. The plug-in hybrid can operate up to 20 miles in pure EV mode and BMW says recharge time should take only two hours.

Conventional door skins replace the lower glass from the concept.

The i8 is built using layered construction. The main body of the car is made primarily of lightweight carbon fiber. It rides atop an aluminum chassis that houses the lithium-ion battery pack in the floor between the rails, while the engine is mounted just ahead of the rear axle. BMW touts the i8 as an ultimate driving machine thanks to its all-wheel drive and 50/50 weight distribution.

PRODUCTION PLANS: The BMW i8 will be on the road in less than two years. Test mules have been spotted on the road and reveal that the doors will be more conventional in appearance, with the lower glass replaced with composite panels due to side-impact requirements. The i3 electric will come first, followed by the i8 plug-in hybrid as BMW launches this new sales channel.



WHAT'S NEXT:

At the Beijing Motor Show, BMW showed a roadster version of the i8, which also gives a clue to the car's production look since it has the new doors that aren't all glass. The smaller 2-seat concept also showcases a new twin-turbo gasoline engine that combined with the electric motor puts out 354 hp.

MORE ONLINE roadandtrack.com/BMWi8

PHOTO-ILLUSTRATION BY LARSON



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LAMBORGHINI

AVVENTURA



One of a kind

PHOTOS BY WOLFGANG SPACCARELLI

THE BACK STORY: Calling it “a force of nature on wheels,” Lamborghini literally stole the Geneva show with a one-off concept called the Aventador J, a cut-down roadster version of its V-12 flagship. Lamborghini’s recent history has included building limited-run specials like the Reventón, but the Aventador J (the letter standing for Jota, which recalls a special 1970 one-off Miura) is the most limited of all. Only one was built, the company said, and it already has a customer. What made this car such a surprise was the fact that many were expecting to see the production roadster version of the standard Aventador. Despite its radical looks (there is virtually no windshield), the Aventador J began life as



Depreciation shelter.

No other luxury brand has won more 2012 ALG Residual Value Awards than Audi.*

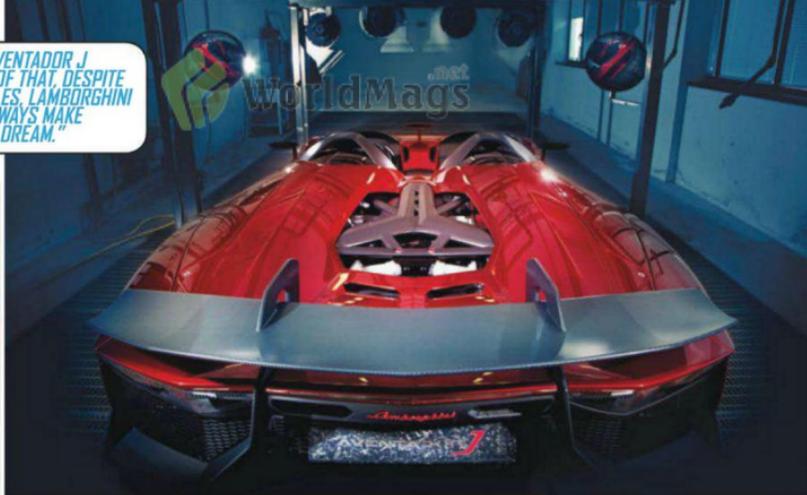
The financial market has definitely seen its share of uncertainty. You've probably started to question anything associated with the words "Wall" and "Street." But there is one thing you can be certain of. Audi vehicles are being recognized not just for their performance, looks and technology, but for their ability to hold their value over time — vehicles like the seven-passenger Audi Q7 and the luxurious Audi A6 sedan. So while they can't help stabilize the market, they could very well stabilize your peace of mind.



ALG AWARD WINNER

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"THE AVENTADOR J IS PROOF THAT, DESPITE THE RULES, LAMBORGHINI WILL ALWAYS MAKE PEOPLE DREAM."



a standard model and as a result, the factory says that it is fully functional for road use. According to Stephan Winkelmann, president and CEO of Lamborghini, the J "is the most radical open sports car in our history. Its name comes from our tradition and combines an unconventional design with technology innovation. Nowadays we are confronted with several regulations that we face in the spirit of challenge. The Aventador J is proof that, despite the rules, Lamborghini will always make people dream, even in the future." In essence, the car is evidence that the Italian automaker will never give up its quest to build the most extreme and outrageous vehicles on the road today.

WHAT MAKES IT UNIQUE: While the basic lower body shape is shared with the Aventador, the radically chopped top adds to the car's low, muscular stance and the open nature of the cockpit allows that space to blend seamlessly with the exterior design. The Aventador J stands just 43.7 in. tall—the highest points on the car are the roll hoops behind the seats and the center, pylon-mounted rearview mirror. The basic powertrain remains unchanged—it's a 6.5-liter V-12 producing 700 bhp. The gearbox is Lamborghini's automatic-clutch

ISR transmission, which delivers power to all four wheels. The Aventador J rides on a racing-inspired pushrod suspension system. Along with removing the roof, the Lamborghini has dispensed with air conditioning and makes generous use of carbon fiber as weight savings measures resulting in a car that tips the scales at 3465 lb. The use of carbon fiber also extends to the use of a new material called Carbonskin, which employs a soft epoxy resin that allows it to be used like fabric. Part of the appeal of the Aventador J is its minimalist approach to the cabin, which has no center stack, onboard navigation or audio system. Instead there is a small control panel housing the starter button and the switches for the lights and transmission. Instrumentation is presented on two simple TFT displays behind the steering wheel. Not only is the cockpit open, but the engine cover is more of an exposed brace with two large openings designed to showcase the engine banks.

PRODUCTION PLANS: It's been produced for a customer, so essentially the run is complete. Rumors put the price paid at somewhere between \$2–\$3 million. However, Lamborghini plans to launch the standard Aventador roadster sometime next year.



WHAT'S NEXT:

Lamborghini is resisting offers to build additional Aventador J models and has turned its attention on a limited run of 20 production versions of the Sesto Elemento, a previous Gallardo-based concept that is carbon fiber-intensive in its construction.

MORE ONLINE roadandtrack.com/Aventador-J

WWW.ROADANDTRACK.COM

63

PHOTO-ILLUSTRATION BY CHRIS DOANE

While there is only one J, it won't be the sole open-top Aventador, as a more traditional roadster is in the works.





CADILLAC CTS

Upmarket aspirations

THE BACK STORY: Starting with the introduction of the radically styled CTS in 2003, Cadillac has sought to remake itself from the image of selling softly sprung American luxury cars into a world-class player with edgy styling and vehicle dynamics designed to challenge the best Germany has to offer. It has succeeded in some areas, with its V-Series sedans, but not in others, like the 2-seat XLR. And while the upcoming XTS with its transverse engine and all-wheel drive may appeal to some of its more traditional buyers, Cadillac clearly needs a new range topper to go toe-to-toe with the likes of the BMW 7 Series, Mercedes-Benz S-Class and Audi A8. But there is also a camp within the company that would like



"THIS CAR CAN BE VIEWED AS THE NEXT INSTALLMENT IN A SEARCH FOR A NEW AMERICAN GRAND CLASSIC."



to offer such a car on Cadillac's own terms, that is, offering a car with the size and handling attributes of those German benchmarks, but something that is more uniquely American in its approach to design. And rather than use an auto show to drive that point home, Cadillac took the wraps off the Ciel concept last August at the Pebble Beach Concours d'Elegance, primarily to draw attention to its statement-making classic design cues. This car can be viewed as the next installment in a search for a new American grand classic that began with the Cadillac Sixteen concept car.

WHAT MAKES IT UNIQUE: First off, the Ciel (which is French for sky) is a 4-door convertible with coach-style doors, something not seen on an American car since the 1960s in the Lincoln Continental. In fact, there is much about the Ciel that recalls that classic, not just from the number of doors and how they open, but also the strong nose-to-tail character lines that top the fenders and the relatively slab-sided nature of the body. The vertical lighting front and rear, and the large egg-crate grille are pure Cadillac design themes. The 4-seater's cockpit is divided by a center console and the wood trim comes from a 300-year-old olive tree that was felled by a storm outside of Naples, Italy. Rather than borrow an existing platform, the Ciel actually rides on a purpose-built chassis with a staggeringly long 125-in. wheelbase. The front-mounted engine is a direct-injection twin-turbo 3.6-liter V-6 mated to an electric hybrid system, which produces a combined 425 hp and 430 lb.-ft. of torque. And in typical concept car fashion, it rides on massive 22-in. wheels.

PRODUCTION PROSPECTS: Not likely in its current form. But replace the coach-built doors, put a hardtop on it and, given its 125-in. wheelbase, you have that credible contender for a new Cadillac range topper to take on any German rival.

❖ Rumors of a new Cadillac flagship persist. Such a car may combine elements of the Ciel and the earlier Cadillac Sixteen concepts.

WHAT'S NEXT:

If Cadillac does want to return to its self-proclaimed status as "Standard of the World," it should follow its large full-size sedan with a coupe version of the Cadillac Sixteen or perhaps even dust off the Cien mid-engine sports car to take the place of the late, unlamented XLR 2-seater.

MORE ONLINE roadandtrack.com/CadillacCiel



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Driven BY Design

BY JONATHAN ELFALAN
PHOTOS BY GIDEON GILLARD

THE YEAR IS 2037. BATTERY ELECTRIC Vehicles with a 600-mile range are as ubiquitous as silver Toyota Camrys once were. Steam propulsion is being revisited but R&D in personalizing nuclear power is where all the buzz is. As luxury and exotic carmakers think up new ways to elevate their brand images and MSRPs, Duesenberg Inc. emerges from the depths of obscurity to top headlines with a dramatic new vehicle in a bid to reclaim its former glory. A car inspired by and engineered for the new "citizens of the world"—a growing population of space-born beings made popular by Virgin

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This is, undoubtedly, a pale attempt at ideation, the first step in creating an original vehicle concept. Nonetheless, it serves as an example of how new concepts are born. As I sit in a senior-level Transportation class shadowing Tom Matano—instructor, mentor and highly regarded automotive designer—the

ideas floating around the room have me convinced that the minds and talent of these young, aspiring designers are as bright as they are boundless. Matano, the cordial host, tries to include me in the "critique" of the student sketch presentations, though I find it hard to fault something that could readily be framed and sold as art. What further mystifies

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- Above: An office chat with Tom Matano, AAU's Executive Director of Industrial Design. Top right: Senior transportation design student, Frank Kelly, gives a detailed narrative (which was quite a bit better than the author's) of his vision for the actual Duesenberg revival project. Middle right: To save time and complexity in earlier clay model classes, students will often construct half of a 1/5-scale model that is then reflected across a mirror. This model was one of Luis Camino's, who now works for Skoda.

me is learning that even within this rigorously distilled pool of seven or so senior students—a group one-fifth its original freshman class size—nobody is guaranteed to be snatched up by a car company after graduation day.

Matano explains that there are as few as 2000 car designers worldwide, which makes this industry a tough nut to crack.

In other words, if you want to increase your odds of getting hired, you'd better be gunning for a top-tier school. And in North America this means the Art Center College of Design in Pasadena, California, the College for Creative Studies in Detroit, Michigan, or here under Matano's tutelage at the Academy of Art University in San Francisco, California.





Breaking for lunch, we are joined by a young Thai student, Nathan Kongsarai, who has been recently recruited by Ford. I'm told it's a regular event to have teams of industry professionals—GM has a "talent acquisition" department for this very purpose—visiting various schools to scope out the prospects coming through the pipeline. After passing by one of Nathan's sculptures in the building's hallway—a compelling form that could easily inspire the next Batmobile—you'd have to be blind to miss the utter dedication to his craft and why he was less than 24 hours away from a promising new career in Detroit. Moreover, I've never seen anyone so excited to move there from California—just saying.

What I did find a little surprising was the sheer number of international students who have converged on this city block, one of many owned by the Academy. If Matano's class were an accurate cross-section of the student body, I'd

estimate around 50 percent to have English as their second language. With the process of design very much based on group collaboration and camaraderie, international intermingling can be both a blessing and a curse. The first obvious hurdle is the language barrier, something I observed in a Transportation 2 (sophomore) level class, with some students offering fewer words than others to describe the thought processes behind their exquisite sketch montages. Once you find your way around this, however, you gain valuable perspective, a fresh approach to a common practice—which is why most fusion restaurants work. Matano believes exposure to good design, a nice watch or fancy stereo, or even to just life itself, is an important influence for any designer. And as character traits go, curiosity is key; students ought to question how things function or why they're shaped, built and used the way they are. What is it about that coffee mug or toaster that draws you to it?

This discussion piqued my own curiosity of the efficiency of the whole design process, and how our growing obsession with all things instant and digital might affect the older, semi-dyed-in-the-wool methods that continue to be implemented. One corollary to this is students need to be even more versatile than before, says Antonio Borja, former GM designer turned full-time AAU instructor. They need to know how to sketch, create digital models, know graphic design (because their portfolios need to look amazing), have a web presence, and the list goes on. Granted, students have

Below is one of the many projects by the very talented Nathan Kongsarai, who was just recently snatched up by the Ford Motor Company. Perhaps someday soon a car like this might wear the Blue Oval.



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■ In a small, dark room students have nicknamed "the dungeon," transportation design student Christopher David works diligently on a Cintiq tablet using Alias CAD software. It's said that if the building didn't close between midnight and 8 a.m., they would probably stay all night. That's dedication!

access to fantastic state-of-the-art tools like the Wacom Cintiq (a digital sketch tablet), laser sheet material cutters, 3D printers and 5-axis CNC milling machines. But if they don't know their way around a pen and paper, the virtual world will be especially challenging as the tools are merely digitized versions of the real things. Borja also rationalizes that pure convenience may also keep those seemingly archaic tools around. He recalls his GM days when it was often much easier to lay down a sketch on paper than to power up a computer or try to convey the idea through words.

At the heart of the debate of digital versus analog is the clay model, which to an outsider like myself appears to define the term "boondoggle." But the truth of the matter is that the design community has yet to find its equal in the digital realm. Matano explains it best—with a pen on a restaurant napkin no less—when he talks to you about design "flavor." When you design, there is a certain mathematical line or arc that connects two points. If you manipulate the point of tension on a curve, even by a half-millimeter, it can change the whole character of a car's shape while retaining all critical dimensional points. The effect of this is best seen and felt in the physical world, he says, and plainly there's no better medium to freely sculpt than clay.

To get a younger generational perspective on this, I spoke with a senior-level student in his early 20s named Frank Kelly, who displays an obvious proficiency in 3D modeling with Alias CAD software. He expounded on the advantages of computerized tools, stating

that they allow for a good general idea of what surfaces are doing. But he also admits that real-world clay achieves a level of finesse you simply can't see on a computer screen. You know what he means if you've ever thought a car looked better in person than in photos.

Borja adds that a lot of times computer-rendered models "print out"—as in foam-milled replicas accurate to within one-one-thousandth of an inch—flatter than they appear on screen. Which means students often have to compensate with slightly "puffier" virtual versions of their designs.

Of course, there's no way of knowing exactly what technology will make possible in the future (get those galactic passports ready!). But as of right now, the bottom line is this: Most, if not all, production car designs will hang on to proven tools like clay modeling. Though he admits it's hard to explain, Matano ardently believes that if something is going to be used or touched by human hands, it should be crafted by human hands, or there will always be an element missing.

It's ironic how the intangible subtleties are achieved only through the most tangible methods. And if you can accept this, well, you've just taken your first step. ■

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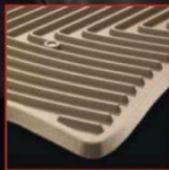
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The Great New HOPE vs. RYPE?

WorldMags.com

There's fresh sheet metal in the bargain rear-drive sports car market, but is it sharp enough to cut it?

BY JONATHAN ELFALAN

PHOTOS BY BRIAN BLADES



What is it about rear-drive cars that excites us? From a physics standpoint, they're inherently advantageous over front-drive vehicles for performance driving—splitting the responsibilities of steering and accelerative forces between front and rear wheels. Compared to all-wheel-drive cars in the same scenario, they're mechanically simpler, generally weigh less and are naturally better balanced.

Emotionally, rear-drive cars—from the accessible to the exotic—assume forms that prioritize passion over packaging efficiency. But this comes at a cost—a smaller market niche with fewer sales—which is why manufacturers either shy away from them entirely or struggle to produce them at affordable prices.

Hyundai, Mazda and now Subaru (and Toyota) prevail against the odds to provide us with three genuine sports-car options at under \$30,000. The MX-5 Miata, on one side of the spectrum, has enjoyed great success with its lightweight *jinba ittai* approach (rider and horse as one), spanning multiple spec-race series, not to mention being a force to fear in numerous autocross classes.

At the other extreme is Hyundai's 2013 Genesis Coupe, pulling no punches as it pushes the output of its turbocharged 2.0-liter engine to a stout 274 bhp and 275 lb.-ft. of torque—and it'll even run on regular-grade pump gasoline if you're feeling stingy.

Right in the middle of the fray is the newcomer—in this case the Subaru BRZ—a joint effort between Subaru and Toyota (Toyobaru?) to revive the soul of the fun, affordable, rear-drive sports coupe. There have been proclamations, rumors, and speculation, and now we are about to see exactly what the engineers at Subaru have wrought.

the engine spins willingly in concert to its own music. The steering is light, precise and communicative, and the brakes offer plenty of stopping power with the highest resolution.

What the Miata lacks, however, becomes readily apparent once driven with purpose against these other cars. Following a lapping session around our local Buttonwillow Raceway track, Associate Engineering Editor Shaun Bailey remarked: "It's got good bones, but needs some work to make it great. In stock form, the suspension is soft, and the seats don't have enough bolstering. Having driven an STR-prepped Miata in SCCA Solo, I know how good it can be. I love and hate this car at the same time." Assistant Road Test Editor Calvin Kim added to this point: "The Miata clearly demonstrates the benefits of lightweight construction, but it's beginning to show its age. While the soft suspension makes the ride livable despite the short wheelbase, it allows for near-endless body roll that begets outer-tire wear."

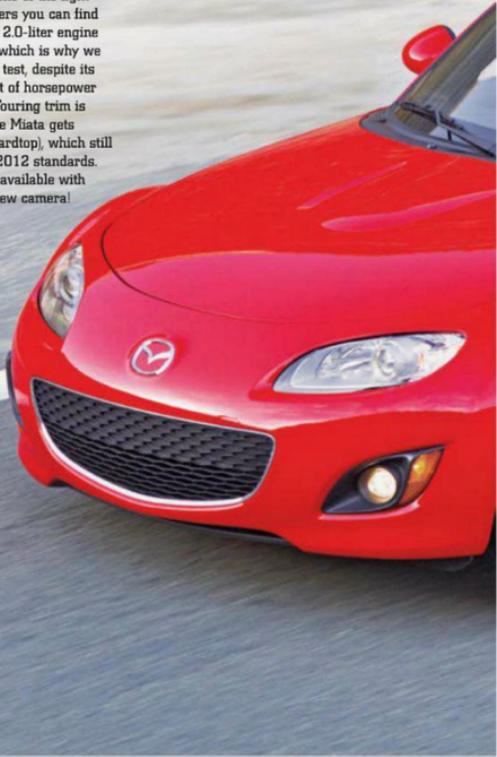


2ND (Tie) Points 369.8 **Mazda MX-5 Miata Grand Touring** Lap Time: 2:14.23

Since 1989, few cars have embodied affordable, quintessential sports-car elements better than the Mazda Miata. Taking cues from the minimalistic British roadster, Mazda hit its mark with remarkable accuracy, producing a sprightly little roadster with a 1.6-liter engine and driving character that would plaster a smile across your face for hours. That design has evolved to what we know currently as the third-generation (NC) MX-5 Miata. It's still a featherweight by modern-day standards (2555 lb.) and is powered by a racy inline-4 that now displaces 2.0 liters, revs to 7200 rpm and makes 167 bhp and 140 lb.-ft. of torque. Equipping this agile 2-seater with the optional Suspension Package gains you sport-tuned Bilstein shocks and a Torsen limited-slip differential—nice upgrades for \$650. But while the Grand Touring trim does its best to deliver creature comforts like automatic climate control, heated leather seats, cruise control and a 7-speaker Bose audio system, the Miata's cozy cabin doesn't exactly lend itself to long, comfortable stints of highway cruising.

Its wheelhouse instead is where the road never straightens, which is where we appreciate it most. Rowing through the close ratios of the Miata's excellent gearbox (the best of this group), we make good use of the available torque as

⚡ Although it's grown a fair amount since 1989, the Miata is still one of the lightest production rear-drivers you can find behind a Lotus. Its MZR 2.0-liter engine has fantastic character, which is why we ranked it highest in this test, despite its making the least amount of horsepower and torque. The Grand Touring trim is about as luxurious as the Miata gets (minus the retractable hardtop), which still feels pretty Spartan by 2012 standards. Hey, even the Kia Rio is available with navigation and a rear-view camera!





LAP TIME: 2:14.23

MAZDA MX-5 MIATA

0-60 MPH
6.6
SEC

0-1/4 MILE
15.0
SEC

TOP SPEED
128*
MPH

SKIDPAD
0.90
G

SLALOM
68.7
MPH



The three of us agreed, however, that never a dull moment was had in the saddle. The sensation of speed produced from a symphony of audible feedback, tactile sensitivity and a tiny cockpit is amplified by the chassis' superb balance, especially in high-speed sweepers. Its 205-mm-wide Bridgestone tires, while skinnier than the BRZ's Michelins, inspired more confidence with a greater level of perceived lateral grip, although our skidpad test numbers say otherwise.

The Miata will never be discounted, for it's still one of the purest, unadulterated sports cars money can buy. But with this third generation already in its sixth year of production, it's inevitable that Mazda will soon need a younger, quicker horse to stay in the race.

❖ While only mild taillight tweaks separate the rear of last year's Genesis Coupe from the one pictured here, the aggressive new front fascia and improved hardware leave no doubts that this is the next-generation car. Muscle is the name of this Genesis Coupe's game, and it has it in spades from its potent turbocharged 2.0-liter engine (274 bhp), sticky summer Bridgestone tires and powerful Brembo brakes.

2ND (Tie) Points 369.8
Hyundai Genesis Coupe 2.0T R-Spec
Lap Time: 2:31.61

Not too long ago, Hyundai was the newest player in the rear-drive coupe world, topping headlines and wish lists of young enthusiasts everywhere. Upon its official release, however, the lackluster base turbo engine and excessive drivetrain lash made for a pretty unrewarding experience behind the wheel. Fast forward

THE "D" FACTOR

Which car drifts best?





LAP TIME: 2:11.61

HYUNDAI GENESIS COUPE

0-60 MPH
6.3
SEC0-1/4 MILE
14.5
SECTOP SPEED
146*
MPHSKIDPAD
0.92
GSLALOM
69.7
MPH

to today, and the updated 2013 Genesis Coupe flaunts a fresh new look, much improved hardware and tuning, and a staggeringly impressive spec sheet at its price point, which might even win some buyers over before the ignition is keyed.

Being the largest fish in our comparison-test pond has its strengths and weaknesses. For one, the Genesis' spacious front cabin, replete with soft-touch materials and supportive seats, is contained within a long wheelbase that

is conducive to a supple ride. The rear seats are still best utilized as additional storage, but that only further extends its clear lead in cargo capacity. Our R-Spec model—that trades “weighty” accouterments like cruise control, a power seat and an infotainment nav system for firmer springs and dampers, 1-mm-larger anti-roll bars, 19-in. wheels and a Torsen limited-slip differential—does a good job of defining its purpose. But what it can't shed is its underlying heft that compress-

es our scales at 3495 lb., wet.

Circling around the R-Spec, and everything from its staggered Bridgestone summer tires to the conspicuous amount of negative camber (1.5 degrees) dialed into the front wheels via factory-supplied camber bolts (installed at your discretion) confirms this isn't just another rocket-powered grocery runner. In fact, around our 2.7-mile track, the Genesis put over 2 seconds between it and the next fastest car, the Subaru

As much as we value the performance edge afforded by the purity and balance of rear-wheel drive, there's almost nothing more gratifying than a big ol' powerslide to scratch an itch. So naturally, this comparison wouldn't have been complete without a thorough evaluation of each car's drift ability. For this delicate task, we enlisted the help of 2011 Formula Drift champion, Dai Yoshihara. No doubt Yoshihara's depth of skill and cool hairdo would make our pictures look pretty, but the fact that his drift car is a stripped-out 1993 Nissan 240SX with a modified Corvette LS7 V-8 also helped keep this competition unbiased.

Knowing that power and torque often play a big part in a car's ability to sustain slip angle at speed—Yoshihara's car makes 570

bhp—we designed a course that would best level the playing field for our three contenders. To vet the course, we had Yoshihara start with the least powerful contender, the Mazda Miata, which he confirmed was adequate with plumes of tire smoke thick enough to hide Cheech and Chong.

After cycling through all three cars, he offered his thoughts: “I like the response and feedback of the Miata. I think it provides the most information of the three cars and is very lightweight, but the suspension is soft, which makes it roll over the front tires too much. Also the handbrake is far away so it's more difficult to operate than the BRZ's or the Genesis', but bottom line is it needs more power.”

Regarding the BRZ, Yoshihara reported: “This is a very good car.

I like its stiff suspension. It also has the most forward bite, so it's possible to achieve the fastest drift with it.” Translation: At higher speeds while the rear tires are slipping, they still provide good forward traction, which affords you more precise control of where the car is going. There are a lot of factors that influence this, Yoshihara tells us, from suspension kinematics to alignment settings, but the BRZ's street setup works pretty well.

The Genesis was his favorite car stylistically, but how is it to drive? “This car makes a lot of power with the turbo engine and I feel like it has the most steering angle, even though the Miata actually has the most. I think this is the easiest car to drift for a beginner, but the front tires don't keep their grip as well and it's a heavy car.



You can get large drift angles, but you can't maintain the forward speed of the slide.”

So if you want the car that's easiest to smoke the rear tires out of the box, go with the Genesis Coupe. But if you're skilled enough to manage your slides with less horsepower, the BRZ is the car to get. Drift responsibly, friends.—JE



BRZ. Having just stepped out of the R-Spec, Kim exclaimed: "The Genesis Coupe shows you what brute force can accomplish, both in power and in tire. Even with lackluster throttle response, for real-world performance, the Genesis Coupe takes the cake." The throttle response and turbo lag Kim refers to are expected in small displacement, high-boost turbo engines. Although the Genesis' new twin-scroll unit and uprated intercooler make for a vast power improvement over the old car, the way this engine builds boost tends to promote surging on the street as well as corner-exit oversteer on track.

Scrubbing off all that momentum before corner entry are powerful Brembo brakes that come standard on all R-Spec and Track models. There's more understeer at turn-in than we'd like, but in fast, sweeping corners like Buttonwillow's "Talladega," this leaves a larger margin of safety that instills confidence. The gaping hole in the Genesis' game, however, is its overall lack of precision. "Where the Miata and BRZ feel like fine instruments," said Bailey, "the Genesis

❖❖ The cabin of the Hyundai Genesis is the plushiest of the bunch, as long as you're sitting up front. Sure, these cars weren't made for passenger hauling, but the slope of the Genesis' rear glass hatch severely limits headroom, even more so than the smaller BRZ. This is a moot point really, as we'd avoid riding in the back of either car.

feels like a ball-peen hammer. It's a great tool for pounding out fast lap times, but it's no fun swinging it over and over. All the parts work, but not harmoniously, which is probably why I don't enjoy driving it much."

We all docked points for the rubbery gearbox and the shift knob that's shaped awkwardly, like a snake's head. And we were simply underwhelmed by the muted steering feel and amount of weight it amasses under progressive steering load. These may all seem like harsh criticisms, but the bottom line is the Genesis Coupe is a lot of car for the money. And as Hyundai continues to evolve its vehicles at a blistering pace, these shortcomings will undoubtedly be addressed, which will be very bad news for the competition.



1ST

Points: 389.2

Subaru BRZ Premium

Lap Time: 2:13.79

The promise of a game-changing rear-drive car in the pipeline first surfaced back in 2009. And now the hope, collaboration and investments between two manufacturers have finally come to glorious fruition here in 2012. But with the mountain of anticipation the Subaru BRZ/Scion FR-S twins have built, would it even be possible for the finished car to meet the inflated, and potentially unreasonable, expectations of the buyer? Would it have the performance? Could it be priced competitively? Would it end up looking like the Autech Stelvio? So many opportunities to drop the ball on the way to the end zone. After pitting the BRZ against what we feel to be its stiffest opposition, we can now confidently affirm that "the game" has been changed.

Subaru has succeeded in defining not only what the BRZ is, but what it is not. It is not a drag-race-winning torque beast, nor is it the fleetest around a road course. It is not a vehicle dependent on fancy torque-vectoring systems or magic roll-eliminating sway bars. It is a car with a rigid chassis designed to be lightweight and engaging, with the lowest achievable center of gravity, which happens to be 0.7 in. below a Porsche Cayman's.

Its suspension is traditional—


WorldMag

MacPherson struts up front, double wishbones in the rear—but the damping and kinematics are incredibly well developed. And with the exception of mild teeth-rattling on some of California's rougher highways, we'd probably call it divine. While making our rounds on the racetrack, Kim noted: "The BRZ's greatest strength is in its balance. It's spectacularly easy to drive hard, and very communicative; you always know exactly what the tires are doing, which is often sliding." Subaru says, and we wholly agree, that the tires aren't about huge grip, but enough grip to be effective without sacrificing longevity. "I think it likes being at a 10-degree (oversteer) slip angle," Bailey said, "not a big lurid drift, but a subtle 4-wheel slide that can be controlled all the way to the exit and sometimes beyond just for fun." Gut-check moments in the BRZ will never stem from unpredictable handling, or sloppy mechanical controls, but rather feelings of flying off track from a lack of tire. You might also need a moment to adjust to its higher-effort brake pedal if you're just getting out of a Miata—there's almost nothing more unnerving than thinking your brakes have gone off.

The 200-hp FA20 flat-4 is legitimately modern—utilizing both port and direct fuel injection—but it's not a marvel of engineering. In fact, some of us found it a little...flat. "There's a dull spot



LAP TIME: 2:13.79

SUBARU BRZ0-60 MPH
6.6
SEC0-1/4 MILE
14.9
SECTOP SPEED
135
MPHSKIDPAD
0.92
GSLALOM
68.0
MPH

in the torque curve that I doubt you'll be able to fill without the use of forced induction," says Kim. But following our musings for something along the lines of a Honda S2000 inline-4 or a Subaru STI 2.5-liter, we agreed that the FA20 fits the character of the BRZ and would ultimately be adequate to live with.

Also very livable is the interior. The BRZ Premium, the base model, comes pretty well-appointed with interior comforts like an 8-speaker sound system and voice-activated/touchscreen navigation, along with other perks like xenon headlights and a Torsen limited-slip differential. We really couldn't care less about the nav/sound system—as it's difficult to see and cumbersome to operate—but sing high praises for the huge centrally mounted tachometer, the comfortable button-free steering wheel and the low-slung, sublimely bolstered seats. A driver's car indeed and well worth the wait.



AT THE TRACK...

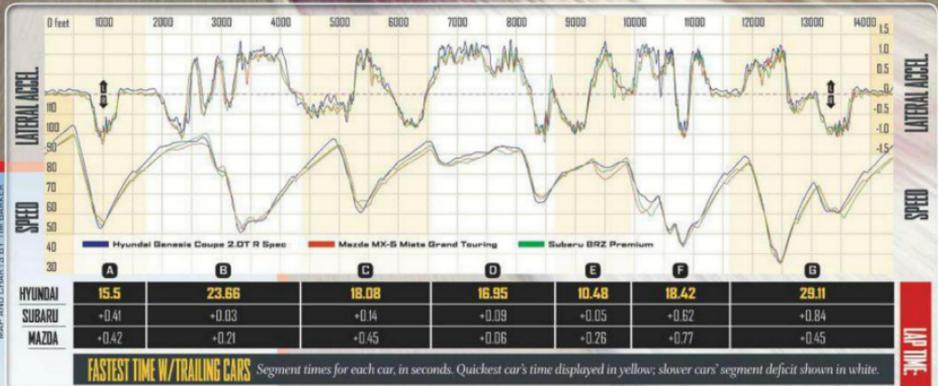


■ Compare the BRZ's gauge cluster to the other two and you'll see why we like it best. The low-slung, driver-friendly seating position is hard to depict in photos as is the excellent outward visibility, afforded by slim A-pillars, door-mounted side mirrors and a low-sloping hood. Bravo, gents!





MAP AND CHARTS BY TIM BARKER



A At the start/finish line on the flying fast lap, the BRZ and Miata are separated by less than 1 mph while the Genesis leads them by 2 mph at 92.4 mph. It eventually doubles that lead, topping out at 104.5 mph before slowing significantly for the tight 90-degree right-hander. The better balanced BRZ and Miata regain some ground here. **B** Accelerating out of Turn 1, the Genesis' power advantage comes into play. The Hyundai is less brilliant through the esses, which is where the BRZ absolutely shines (reaching its maximum speed of 100.7 mph). The entry into the flat sweeper is tight, benefiting both Miata and BRZ as they maintain an average corner speed 1 mph greater than the Genesis. **C** The drag race up to the left-hander called Phil Hill is dominated by the Genesis, but as all three launch over the unsettling crest, it's the BRZ's suspension that allows for a huge confidence margin while the Miata's soft but predictable chassis splits the difference. **D** After exiting a right kink that all three take flat, the high-speed left-hand Talladega sweeper is where the Genesis' understeer is appreciated. Positive road camber falls away at the exit, which is startling in the Miata and heart-stopping in the BRZ. **E** **F** The corners that follow the tight right-hander after Talladega are relatively fast and open. This continues to favor the Genesis' tendency to push, increasing its advantage until all three regroup in the tight crest-and-drop sequence of Cotton Corners. **G** Down the home stretch, the Genesis ekes out more ground with each corner exit. The BRZ and Miata fly neck and neck up until the last corner, where an early apex line yields oversteer in the BRZ, allowing the Miata to finish stronger down the straight.

HYUNDAI	2:11.61
SUBARU	+2.18
MAZDA	+2.62



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The numerical results are telling. All three editors rated each car independently, and after the scores were added and averaged, the Miata and Genesis— which you'll notice racked up points very differently— tied for 2nd place (price independent) down to a tenth of a point. The BRZ, while having the weakest dynamic showing, absolutely dominated the subjective categories as it hits on all the right spots, and seals the overall deal with a very attractive price tag.

The Results

PERFORMANCE

Performance points based on proportional scale (normalization)

	Hyundai Genesis 2.0T	Mazda MX-5 Miata GT	Subaru BRZ Premium
0-60 mph time	30 pts	30.0	28.6
0-1/4 mile time	30 pts	30.0	28.0
Slalom	30 pts	30.0	28.6
Skidpad	30 pts	30.0	28.3
Braking, 60-0 mph	30 pts	29.5	30.0
Braking, 80-0 mph	30 pts	30.0	28.2
Fuel economy, EPA	20 pts	19.4	19.0
SUBTOTAL	200 pts	198.9	193.9

SUBJECTIVE

Subjective ratings based on points awarded in each of 12 categories by editors and scored based on a proportional scale.

Driving excitement	20 pts	16.6	17.4	20.0
Engine	20 pts	18.4	20.0	19.1
Gearbox	20 pts	14.0	20.0	18.6
Steering	20 pts	14.4	19.2	20.0
Brakes	20 pts	20.0	20.0	20.0
Ride	20 pts	20.0	15.4	18.6
Handling	20 pts	14.6	18.0	20.0
Exterior styling	15 pts	12.8	11.9	15.0
Interior styling	15 pts	12.8	12.4	15.0
Seats	10 pts	9.0	7.3	10.0
Ergonomics/controls	10 pts	8.3	7.7	10.0
Luggage space	10 pts	10.0	5.5	9.0
SUBTOTAL	200 pts	170.9	174.8	195.3

POINTS STANDINGS

Points based on a proportional scale, independent of price.

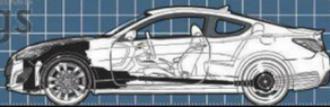
TOTAL POINTS (400 PTS)	369.8	369.8	389.2
FINAL STANDINGS	2	2	1
	Hyundai Genesis 2.0T	Mazda MX-5 Miata GT	Subaru BRZ Premium

STANDINGS, PRICE DEPENDENT

Points based on a proportional scale; points range based on percentage of top price.

Price as tested	198.1	194.3	200.0
	\$27,375	\$28,655	\$28,245
Price-sensitive total points	567.9	564.1	589.2
PRICE-INSENSITIVE STANDINGS	2	3	1
	Hyundai Genesis 2.0T	Mazda MX-5 Miata GT	Subaru BRZ Premium

2013 HYUNDAI GENESIS COUPE 2.0T R-SPC WWW.HYUNDAIUSA.COM



List Price: \$26,500 Standard equipment: dual front, side & curtain airbags, traction & yaw control, Torsen limited-slip diff, track-tuned suspension, Brembo brakes, front strut tower brace, 19-in wheels w/ summer tires, tilt/telescope steering, leather seat bolsters/steering wheel/shift knob, 6-speaker AM/FM/USB/aux/MP3 radio w/ USB/iPod connector, Bluetooth, power mirrors/windows/door locks, dest charge (\$375) **As Tested: \$27,375**

SPECIFICATIONS

GENERAL DATA

	Hyundai Genesis 2.0T	Mazda MX-5 Miata
Curb weight	3495 lb	2555 lb
Test weight	3665 lb	2725 lb
Weight dist (w/ driver), f/r, %	55/45	51/49
Wheelbase	111.0 in.	91.7 in.
Track, f/r	63.0 in./63.6 in.	58.7 in./58.9 in.
Ground clearance	5.1 in.	4.6 in.
Length	182.3 in.	157.3 in.
Width	73.4 in.	67.7 in.
Height	54.5 in.	49.0 in.

ENGINE

Type	aluminum block & head, dohc 4-valve/cyl turbocharged I-4	aluminum block & head, dohc 4-valve/cyl I-4
Displacement	1999 cc	1999 cc
Bore x stroke	86.0 x 86.0 mm	87.5 x 83.1 mm
Compression ratio	9.1:1	10.8:1
Horsepower (SAE)	274 bhp @ 6000 rpm	167 bhp @ 7000 rpm
Torque	275 lb-ft @ 2000 rpm	140 lb-ft @ 5000 rpm
Redline/limiter	6500/6600 rpm	7200/7400 rpm
Fuel injection	port	port

CHASSIS & BODY

Layout	front engine/rear drive unit steel	front engine/rear drive alum hood, trunk/unit steel
Body/frame	13.4-in. vented discs, 4-piston fixed calipers/13.0-in. vented discs, 4-piston fixed calipers; vacuum assist, ABS	11.4-in. vented discs, 1-piston sliding calipers/11.0-in. discs, 1-piston sliding calipers; vacuum assist, ABS
Wheels	cast alloy 19 x 8 1/2, 19 x 8 1/2 r	cast alloy 17 x 7
Tires	Bridgestone Potenza RE050A; 225/40R-19 89Y f, 245/40R-19 94Y r	Bridgestone Potenza RE050A; 205/45R-17 84W
Steering	rack & pinion, hydraulic power assist	rack & pinion, hydraulic power assist
Steering ratio	14.3:1	14.0:1
Turns, lock to lock	2.7	2.7
Suspension, f/r	MacPherson struts, coil springs, tube shocks, anti-roll bar/multilink, coil springs, tube shocks, anti-roll bar	upper & lower A-arms, coil springs, tube shocks, anti-roll bar/multilink, coil springs, tube shocks, anti-roll bar

ACCOMMODATIONS

Seating capacity	2+2	2
Head room, f/r	39.0 in./32.5 in.	37.0 in./na
Front leg room	45.0 in.	43.0 in.
Rear knee room	20.0 in.	na
Trunk space	10.0 cu ft	5.3 cu ft

FUEL ECONOMY

Our driving	14.6 mpg	23.9 mpg
EPA city/highway	21/30 mpg	21/28 mpg
Capacity/range	17.2 gal./237 miles	12.7 gal./280 miles
Recommended fuel	premium or regular	premium

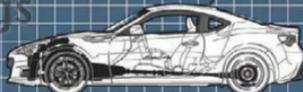


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SCALE: 10 IN. (254 MM) DIVISIONS

List Price: \$26,820 Standard equipment: dual front & side airbags, traction & yaw control, cruise control, front shock tower brace, 7-speaker Bose audio, AM/FM/MP3/AUX, 6-disc changer, summer tires, heated leather seats, leather steering wheel/shift knob/handbrake, keyless entry, power mirrors/windows/door locks. Options: Premium pkg (xenon headlights, SiriusXM, Bluetooth, keyless ignition, alarm) \$1390, Suspension pkg (sport-tuned Bilstein shocks, Torsen diff) \$650, dest charge (\$795). **As Tested: \$28,655**



DRAWINGS BY TIM BARKER

© ROAD & TRACK/HEARST MAGAZINES, INC.

List Price: \$25,485 Standard equipment: dual front, side & curtain airbags, traction & yaw control, front-strut tower brace, torsen limited-slip diff, xenon headlights, Bluetooth, voice-activated navigation system, 8-speaker AM/FM/MP3/AUX/MP3/iPod with iPod adapter, leather steering wheel/shift knob/handbrake, split fold rear seats, power mirrors/windows/door locks, dest charge (\$750). **As Tested: \$28,245**

PERFORMANCE

■ Genesis 2.0T ■ MX-5 Miata ■ BRZ



ACCELERATION

	Hyundai Genesis 2.0T	Mazda MX-5 Miata	Subaru BRZ
Time to distance, seconds			
0-1320 ft (1/4 mile)	14.5 @ 99.1 mph	15.0 @ 92.6 mph	14.9 @ 94.0 mph

BRAKING

	Hyundai Genesis 2.0T	Mazda MX-5 Miata	Subaru BRZ
Minimum stopping distance			
From 60 mph	124 ft	122 ft	128 ft
From 80 mph	219 ft	223 ft	233 ft

HANDLING

	Hyundai Genesis 2.0T	Mazda MX-5 Miata	Subaru BRZ
Lateral acceleration*	0.92g	0.90g	0.92g
Balance	moderate understeer	mild understeer	mild understeer
Slalom speed**	69.7 mph	68.7 mph	68.0 mph
Balance	moderate understeer	neutral	neutral

*1000-ft slaloms; **700-ft slalom, 100-ft spacing.

INTERIOR NOISE

	Hyundai Genesis 2.0T	Mazda MX-5 Miata	Subaru BRZ
Idle in neutral	57 dBA	55 dBA	50 dBA
Maximum, 1st gear	79 dBA	82 dBA	79 dBA
Constant 50 mph	68 dBA	74 dBA	74 dBA
Constant 70 mph	76 dBA	79 dBA	77 dBA

DRIVETRAIN

Hyundai Genesis 2.0T		Transmission:		6-speed manual	
Gear Ratio	Overall ratio	(Rpm) Mph			
1st	3.85:1	14.34:1	(6500) 36		
2nd	2.32:1	8.64:1	(6600) 60		
3rd	1.62:1	6.05:1	(6600) 86		
4th	1.23:1	4.60:1	(6600) 113		
5th	1.00:1	3.73:1	(6600) 139		
6th	0.79:1	2.96:1	est (5500) 146*		
Final drive ratio			3.73:1		
RPM @ 60 mph in top gear		2300			

* Electronically limited.

Mazda MX-5 Miata		Transmission:		6-speed manual	
Gear Ratio	Overall ratio	(Rpm) Mph			
1st	3.82:1	15.64:1	(7400) 35		
2nd	2.26:1	9.27:1	(7400) 59		
3rd	1.64:1	6.72:1	(7400) 81		
4th	1.18:1	4.83:1	(7400) 113		
5th	1.00:1	4.03:1	est (7100) 128*		
6th	0.79:1	3.23:1	est (5600) 128*		
Final drive ratio			4.03:1		
RPM @ 60 mph in top gear		2600			

Subaru BRZ		Transmission:		6-speed manual	
Gear Ratio	Overall ratio	(Rpm) Mph			
1st	3.63:1	14.87:1	(7400) 35		
2nd	2.19:1	8.97:1	(7400) 58		
3rd	1.54:1	6.32:1	(7400) 83		
4th	1.21:1	4.97:1	(7400) 105		
5th	1.00:1	4.03:1	(7400) 127		
6th	0.77:1	3.34:1	est (6000) 135		
Final drive ratio			4.03:1		
RPM @ 60 mph in top gear		2700			

Subaru BRZ

2790 lb
5845
101.2 in.
59.8 in./60.6 in.
4.9 in.
166.7 in.
69.9 in.
50.6 in.

aluminum block & heads, dohc
4-valve/cyl F-4
1999 cc
86.0 x 86.0 mm
12.5:1
200 bhp @ 7000 rpm
151.8-hr @ 6400 rpm
7400/7400 rpm
direct & port

front engine/rear drive
alum. hood/unit steel
11.6-in. vented discs, 2-piston
sliding calipers/11.6-in. vented
discs, 1-piston sliding calipers;
vacuum assist, ABS
cast alloy
17 x 7
Michelin Primacy HP;
215/45R-17 87W

rack & pinion,
electric power assist
13.8:1
2.5
MacPherson struts, coil springs,
tube shocks, anti-roll bar/upper &
lower A-arms, coil springs, tube
shocks, anti-roll bar

2+2
38.0 in./34.0 in.
45.0 in.
18.0 in.
6.9 cu ft

25.1 mpg
22/30 mpg
13.2 gal./306 miles
premium



LeMay

America's Car Museum

BY THOS L. BRYANT

THE FIRST WEEKEND IN JUNE WAS A MOMENTOUS occasion for car enthusiasts as the newest and grandest automotive museum in the U.S. opened its doors. LeMay—America's Car Museum is in the heart of the city of Tacoma, Washington, in a space-age-looking building adjacent to the Tacoma Dome.

Within the confines of the four-story ultra-modern structure there are automobile displays to whet the appetites of everyone who loves cars. "Ferrari in America" is a salute to the U.S. importer Luigi Chinetti and the design and technology of Ferrari automobiles. It is staged on one ramp leading up from the basement floor.

❑ The wood, steel and glass museum is a magnificent structure with a grand entrance. Classic cars line up on the main floor while artworks and memorabilia enhance the display. Special clubs available for membership like the Concours Club provide privacy and nourishment, and the displays of cars are breathtaking.





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Another exciting display tracing enthusiast history is "The British Invasion" on another ramp. Plus, there are some 350 vintage cars filling various parts of the enormous (165,000 sq. ft.) museum.

Downstairs in the Club Auto area are cars belonging to members of the museum's club, along with a place for working on their cars and a refreshment room. Also available for members is a large slot-car racing layout that will spark lots of memories for kids of all ages.

Outside the building is a 3.5-acre lawn area known as Haub Family Field with a go-kart track surrounding it for special events—including kart races. In addition, the field held some 300 collector cars from various clubs on opening day. And it will be the ideal setting for concours d'elegance, hot-rod shows, music festivals and other outdoor activities.

With more than 10 years of leadership from Nancy LeMay and Museum CEO David Madeira, the grand opening of LeMay—America's Car Museum was a spectacular kickoff to an unparalleled museum for people passionate about cars. It is truly unique in the universe of automotive museums with its constantly changing exhibits and special programs.

MORE ONLINE   roadandtrack.com/lemay

❖ A variety of displays including "Ferraris in America" and "The British Invasion," American cars like this beloved split-window Corvette plus antiques and show-car prototypes round out the abundant space within this stunning space-age building in Tacoma. The grass field offers 3.5 acres of outdoor display area for cars, concerts and a surrounding go-kart track.



❖ Club Auto is a popular membership area on a lower floor of the museum. It and other Club Auto sites in Colorado and Arizona (with more to come) provide space for members to gather, work on their cars, and enjoy the abundant events at the LeMay.



❖ The museum's setting overlooking Tacoma harbor is impressive.





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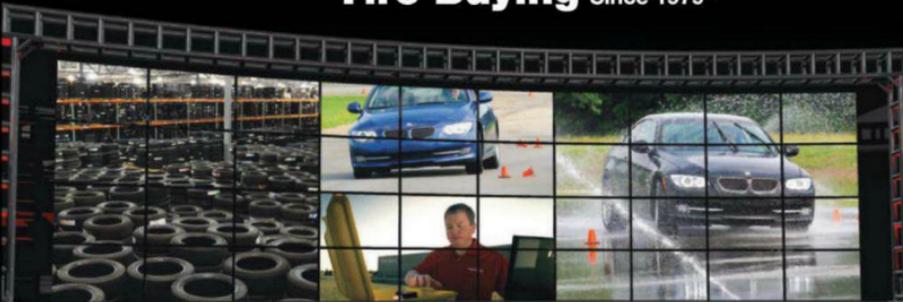


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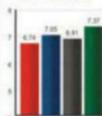


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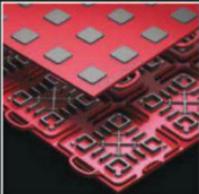
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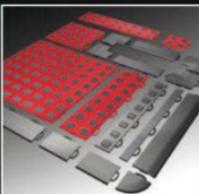
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BECAUSE A MAN CAN NEVER HAVE TOO MANY TOOLS

THE WELL-EQUIPPED GARAGE

To those who love tinkering, the garage can be many things: a sanctuary, a place for quality time with your favorite toys, an alchemist's lab where beer turns ideas into reality. Whatever role the garage plays in your life, it's easy to see its potential as more than just a place to park. It calls out to be used, and to be useful. We offer the following pages as a guide to stocking your garage with the right tools, from the smallest hand-held items to the big gear that will make your neighbors jealous.



**IT'S TIME
TO RECLAIM
THE GARAGE
FROM RAKES,
BROOMS,
AND BIKES.
HERE'S
WHAT YOU
NEED TO
MAKE
IT YOURS.**

**CHECK THE
BOXES
NEXT TO EVERY
TOOL YOU HAVE.
THEN BUY OR
BORROW ALL
THE ONES YOU
DON'T.**

**TOOL TIP:
6- VERSUS 12-POINT SOCKETS**

A six-point wrench or socket grabs more of a fastener's sides than its corners and is less likely to round off the contact points. Twelve-points have an advantage in tight spaces where your turning angle might be limited. If you can only pick one of each, go with six-point sockets and 12-point wrenches.



DEEP SOCKETS
Handy for nuts with tall, exposed bolts or for anything in a recessed location. You're going to be using these a lot.

TORX BITS
Like hex keys, only with a six-point design. Essential for some brake calipers.

HEX KEYS
Also known as the allen wrench, or that tool for IKEA furniture. You need a hand-set for leverage; socket attachments are a nice plus.

SOCKETS
They'll handle every nut and bolt you'll find. Get a metric set and skip on the fractional-inch sockets—most current cars are metric.

RATCHETS
These let you keep wrenching without lifting the socket off the bolt. The drive—the square that holds the socket—is commonly 3/8-inch, but add 1/4-inch- and 1/2-inch-drive wrenches for smaller or larger jobs, respectively.

EXTENSIONS
These give you extra length or a small bend for those hard-to-reach places.

SCREWDRIVERS
You want at least three head sizes in Phillips and slotted styles, plus short and long versions. And don't forget special heads such as Torx.

NUT DRIVER
Think of it as a socket-headed screwdriver. Often included in tool kits with interchangeable bits; you can also buy separate sets.

START SMALL

Tool collecting is a journey, not a destination—you're never done hunting and acquiring. Even though the essentials displayed here comprise a broad and comprehensive set, there are tiny variations on these babies too numerous to list. Go deep into specialty tools for tasks such as engine rebuilding, and an even larger universe awaits. Our advice: Start with the basics and add to suit your budget and needs. And remember that good tools last for generations, so take a lesson from your dad and buy quality items with a guarantee.

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MEASURING TAPE

Measure twice, cut once, as the saying goes. Because cutting twice is just plain crazy.

WRENCH & REACH

Wrenches, like sockets, are the heroes of the tool kit—you'll use them for everything. We like combination wrenches, which have an open and a box end in each size. Nearly every bolt you see on a modern car can be turned with a metric wrench, but Imperial sizes might help with the old lawn mower.


ELBOW RATCHET

Locking, swiveling heads make them super-versatile.

PICKUP TOOL

Too lazy to bend down? Get this.


RATCHETING WRENCHES

See inset at bottom.


HOOKS AND PICKS

Able to pick and pry where your fingers prove too fat, these usually come in a set.


FEELER GAUGE

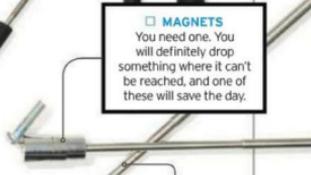
Use it to measure spark-plug gaps and tappet clearances. Even if you rarely use it, you'll be happy it's there.


TINY WRENCHES

Adorable but also useful.


MAGNETS

You need one. You will definitely drop something where it can't be reached, and one of these will save the day.


MIRROR

You can always poke around blindly, but every so often it pays to visually assess the situation.


ADJUSTABLE WRENCHES

Commonly known by the brand name Crescent, they're lauded for their versatility. A few sizes belong in every toolbox.


TOOL TIP: RATCHETING WRENCHES

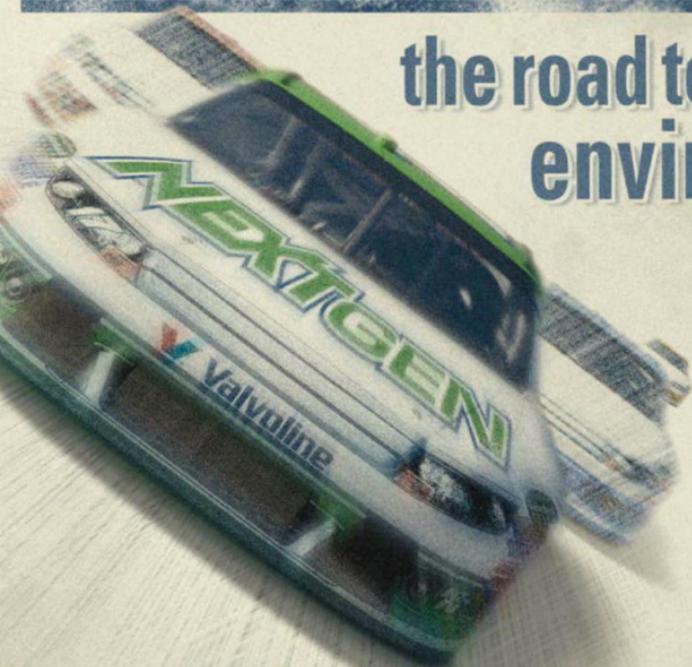
With tiny ratcheting mechanisms built into the heads, they're more expensive than regular wrenches but worth it in time savings alone—to say nothing of the amount you'll save in swear-jar contributions. They're a godsend in tight spaces. Go with a small set of common sizes if you're on a budget.

next page **PLIERS** >

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environment
leads to
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Congratulations to Matt Kenseth on winning

The Daytona 500 with **NextGen** TECHNOLOGY



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TAP AND DIE KIT

These seldom-used tools can be lifesavers. Taps cut threads into holes; dies make threads on a bolt. You often can use them to restore cross-threaded fasteners. Failing that, just drill and tap a larger hole for a larger bolt. Most modern cars use metric threads.

LONG-REACH NEEDLE-NOSE PLIERS

The example pictured has a double hinge for a wider-opening angle in a narrower space.

GRIP & GRIN

Pliers grip harder than your hands can. A few basics, such as needle-nose, tongue-and-groove, and slip-joint are key. You'll be surprised how some extras, like small needle-nosed pliers, can come in handy. As for locking pliers (a.k.a. Vise-Grips), you're going to want two or three of those suckers—they're like having extra limbs.

LINEMAN'S PLIERS

Good for clipping heavy-gauge wire or small bolts.

SNAP-RING PLIERS

Every once in a while, you'll come across a circular, C-shaped clip. You'll need this tool to take it off and put it on.

NEEDLE-NOSE PLIERS**SLIP-JOINT PLIERS**

Two hinge positions for double the fun.

DIAGONAL CUTTERS**NEEDLE-NOSE LOCKING PLIERS****TOOL TIP:****HOSE-CLAMP PLIERS**

Under nearly every hood is a series of coolant hoses, each with an incredibly frustrating spring clamp. This special tool mitigates the annoyance by grabbing the clamp perfectly and ratcheting precisely. A cable-operated version lets you reach into the bowels of an engine bay with ease.

LOCKING PLIERS

The Vise-Grip brand lends its name to this tool. Great for wrenching off rounded bolts, holding items still, and clamping stuff like crazy.

TONGUE-AND-GROOVE

Another genericized brand name: Channellock. These slide up and back for a variety of widths. You'll need at least one.



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□ LINE WRENCHES

These C-shaped, five-point-end wrenches are ideal for tightening brake lines. They slide over the line and onto a fitting.



□ BRAKE-BLEEDER TANK

The most-expensive fluid-draining solution but also one of the easiest. The tank creates a vacuum to suck brake fluid through each caliper.

□ VACUUM BRAKE BLEEDER

Another one-person way to bleed brakes, this unit requires an air compressor to provide suction.

□ BLEED BOTTLES

□ BRAKE SPRING PLIERS

For attaching tricky return springs on drum brakes.

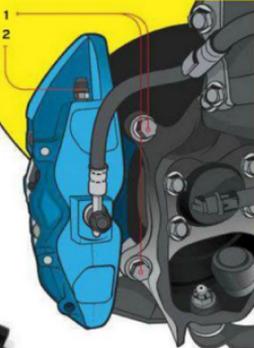
□ BRAKE SERVICE KIT

□ BRAKE SPREADER

The pistons in a caliper automatically compensate for pad wear. To install new full-thickness pads, you'll need to push back the pistons.

TOOL TIP: SIZING UP BRAKES

Disc brakes look intimidating but are actually quite simple. This fixed caliper allows you to change pads merely by removing two small pins. Removing two bolts (1) allows detachment of the whole caliper. The nipple-shaped component (2) is the bleeder screw where you attach the hose to drain the brake fluid.



BRAKE TIME

A brake job is one of the simplest do-it-yourself auto-repair tasks, but you'll need the right tools to get it done properly. A bleeder kit and a pad spreader (or C-clamp) are essential, while other tools make the job go faster. Make sure you consult some how-to resources before your first attempt.

HAMMERS

Contrary to what you may have learned in preschool, there is a specific way to pound on everything and a different hammer for each kind of blow. Reluctant brake parts may need one of the following: 1) Ball-peen hammer for general metal-bashing and hitting punches and chisels. 2) Soft-faced hammer with replaceable heads to tap lightly on finished surfaces.

3) Rubber mallet for a light touch.

4) Drilling hammer for when serious force is needed. 5) Dead-blow hammer, filled with lead shot to reduce recoil.

- 1
- 2
- 3
- 4
- 5



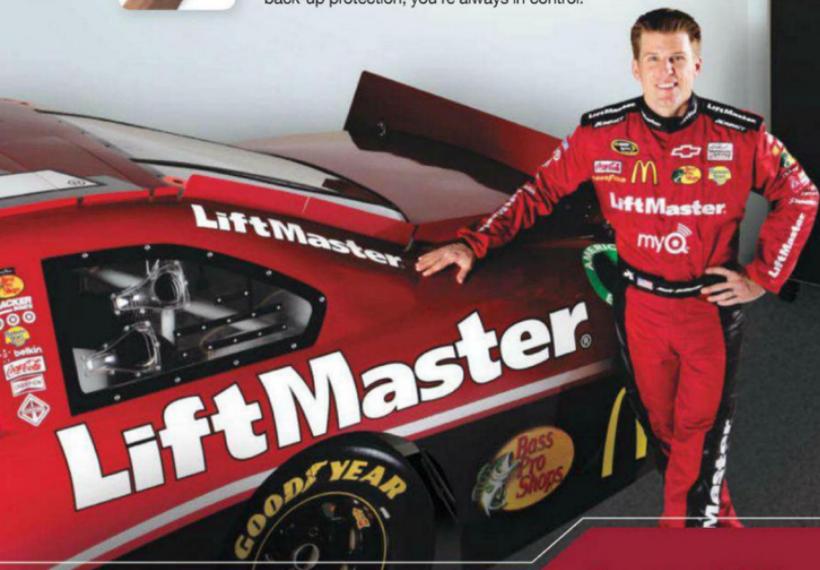


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□ IMPACT WRENCHES

With their internal hammers, impact wrenches dispatch even the tightest bolts. Go big for more torque or stay small for lighter weight.

□ DRILL BITS**□ CORDLESS DRILL**

The essential cordless tool. If you're willing to pay extra, get lithium-ion batteries, which are lighter and recharge faster.

□ IMPACT DRIVER

This manual tool breaks stubborn screws free with a swift blow from a hammer.

□ PRY BAR

No more bent screwdrivers—this is the right tool when you need leverage. The one here has an adjustable claw.

□ CORDLESS RATCHET

Yes, they even make a cordless ratchet (it's more useful than you might think).

□ EVEN MORE POWER

Lights, saws, nail guns, and even caulk guns can be part of your cordless army.

- 1
- 2
- 3
- 4

4 KEY COMPRESSED-AIR TOOLS

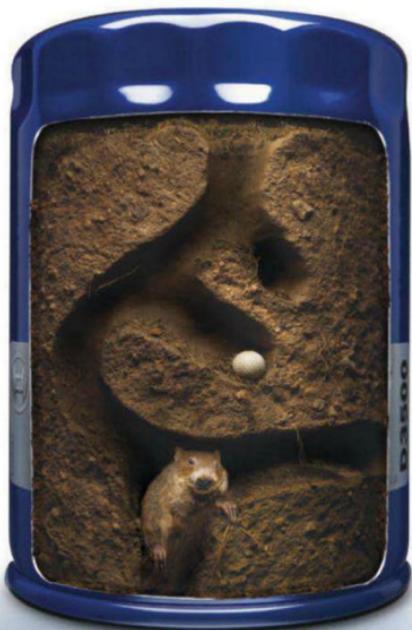
For bigger jobs requiring more torque than cordless hand-helds typically provide, you'll want to consider the following tools: 1) die grinder, 2) ratchet, 3) reciprocating saw, 4) impact wrench. Next, consider opening your own body shop.

**TOOL TIP:
□ IMPACT SOCKETS**

You might think you can use any old socket with an impact wrench. Technically you can, but you shouldn't. Impact sockets are made of hardened steel to withstand the heavy, sudden forces of an impact wrench. Use a regular socket and you'll wear it down or, even worse, send parts flying.

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ADD THIS STUFF

From must-have items such as a torque wrench and an oil-drain pan to useful gadgets like a multimeter, there are an endless number of ways to fully equip your garage. Do it right and you'll be able to tackle almost any task life throws at you, or at least the ones that can be solved with elbow grease.

□ **SOLDERING IRON**

**TOOL TIP:
OIL-FILTER WRENCH**

No matter how gently you first screw them on, oil filters are almost always a pain to remove. Which is why you need an oil-filter wrench. Two useful styles are pliers [1], which grab hard, and swivel [2], which works well in tight spaces.

- 1
- 2

□ **SCAN TOOL**

Why is your "check engine" light on? It's easy to find out, and even if you can't fix it yourself, this tool will keep the mechanic honest.

□ **MULTIMETER**

A figurative flashlight for automotive electronics, this device measures voltage, resistance, and current.

□ **WIRE STRIPPER/CUTTERS**

□ **TABLE VISE**

It's like having an extra hand that is heavy and very accomplished at squeezing.

□ **C-CLAMPS**

□ **BENCH GRINDER**

Use this to clean, polish, or grind.

□ **TORQUE WRENCH**

Whether it's for properly tightening lug nuts or bolting down a cylinder head, this tool lets you dial in a precise amount of torque. Digital versions cost more but are idiot-proof.

□ **KITTY LITTER**

Good for spills; no substitute for an actual toilet.

□ **OIL-DRAIN PAN**

Think of it as a bedpan for your vehicle.

□ **MECHANIC'S CREEPER**

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BONUS

THE WELL-EQUIPPED GARAGE

WorldMag



□ BUILT-IN CABINETS

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□ WET/DRY VACUUM

Hey, spills happen. No matter how nasty they get, a sucker like this cleans them up.

□ SMALL AIR COMPRESSOR

Great for tire inflation and small-scale air tools such as brake bleeders.

□ AIR COMPRESSOR

Powerful, continuous-use tools need a big one. It can be noisy, so stash it in a closet.

□ JACK STANDS

Leaving a car elevated with a floor jack is dangerous, and using cinder blocks is just dumb. You'll want four of these.



TIRE STORAGE

Whether they're winter tires, race tires, or just spares from the dump, hang 'em high and keep your floor space clear.

TOOL CARTS AND CHESTS

Once you have enough tools, they'll need a proper home. Smaller tool chests, such as the box on top, start at a few hundred dollars; rolling chests cost more than \$1000.

FLOORING

A good floor not only looks sharp, it also prevents spills from staining your concrete. Options range from do-it-yourself modular systems (one from MacNeil is shown above) to professionally applied coatings.

FLOOR JACK

Make sure it has at least a two-ton capacity and that it's built to last.

MECHANIC'S SEAT

Why squat when you can sit?

WELDER

The first step toward your own custom-bike-shop reality show. Don't forget the safety gear, and be nice to your dad.

DREAM BIG

If you're ambitious and dedicated, the garage can be the ultimate home-renovation project. Fill it with these big-ticket items—the rest of the details, such as wall art and beer-fridge location, are up to you. One final piece of advice: A urinal can be more useful than a sink.

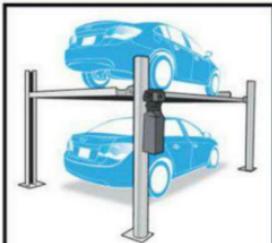
BONUS

THE WELL-EQUIPPED **GARAGE**

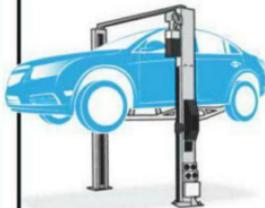
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GET LIFTED

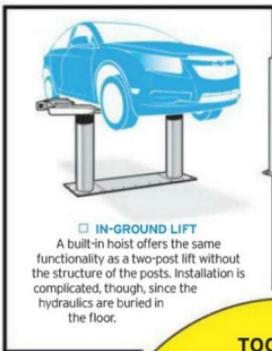
The lift is the holy grail of the amateur mechanic's garage. It makes simple tasks easier and complex tasks possible. A lift is a big deal to install; you might even need to repour your concrete floor. Here are four common styles to consider:

**□ FOUR-POST PARKING LIFT**

Maybe you don't have room to expand your garage, or maybe you just have a lot of cars. Either way, this lift maximizes storage space.

**□ TWO-POST LIFT**

The most common kind of lift, its arms adjust to fit a wide range of vehicles. This type leaves the wheels hanging for chassis repairs.

**□ IN-GROUND LIFT**

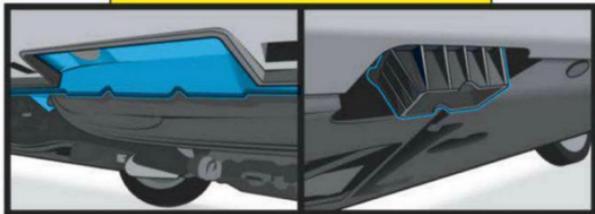
A built-in hoist offers the same functionality as a two-post lift without the structure of the posts. Installation is complicated, though, since the hydraulics are buried in the floor.

**□ FOUR-POST SERVICE LIFT**

Four-post lifts offer ease of use and will accommodate almost any four-wheel vehicle, plus they can be mounted on less substantial floors.

**TOOL TIP:
JACK POINTS**

Every car has specific jack points, places underneath where the structure is designed to accommodate a lift pad or a floor jack. They're typically located between the wheels and the lower sill. Look for notches (left) or footings (right). Otherwise, play it safe by reading the owner's manual.



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Rookie on the Rise

Lights champion Josef Newgarden lights up IndyCar

UNTIL HE ARRIVED AT Sebring in early March, Josef Newgarden had never driven an Indy car. As the 2011 Firestone Indy Lights champion, he was more accustomed to the 420-horsepower of a Lights racer than to the 700 bhp of his 2012 Dallara-Honda. And yet, when the final times were posted, the 21-year-old Tennessee driver found himself solidly in mid-field at the IZod IndyCar Series' Spring Training session, where he outpaced several IndyCar veterans including Tony Kanaan, Alex Tagliani, Marco Andretti and Sébastien Bourdais. "I thought it was great," said Newgarden, the

latest hot rookie to join North America's premier open-wheel racing series.

From his beginnings in karts at age 13, Josef has proven to be a quick study. Finishing 2nd in the 2008 Skip Barber National series, he won the Kent Class at the British Formula Ford Festival that year, then placed 2nd in the 2009 British Formula Ford Championship while taking two wins in the 2009 Formula Palmer Audi series. In 2011, following a disappointing 2010 season in GP3, Josef returned to the United States and

Indy Lights where he won five races including a barn-burner in New Hampshire where he lapped the entire field.



■ Newgarden clearly has speed, and he sees IndyCar as a path to F1.

Driving for Sarah Fisher Hartman Racing, Newgarden—who was born in Nashville—continues to impress, finishing 11th in the season opener at St. Petersburg. He struggled a bit at Barber Motorsports Park in Alabama where he placed 17th, but bounced back—and caught the attention of everyone—at Long Beach where he started on the front row alongside pole-sitter Dario Franchitti. Unfortunately, Josef's race ended early. Trying to outbrake the reigning IndyCar champ going into Turn 1 at the start, he was forced to go wide and slid into the tire barrier. "I should have known better with it being Franchitti," he

said. "You've got to have some cooperation from the guy on the inside."

Unfazed by the incident, Newgarden says that given a do-over, he'd do the exact same thing. "It's a hard way to learn. But it's a new series to me, and I've got to learn the drivers and how they work. And how to race Franchitti in the future."

While he's committed to IndyCar for the foreseeable future and would even like to do some NASCAR racing at some point, Formula 1 remains his ultimate goal, and he thinks it will be possible to make the jump from IndyCar to F1, as drivers such as Mario and Michael Andretti, Jacques Villeneuve and Juan Pablo Montoya (to name a few) have done.

"I think it's absolutely possible. There are a



PHOTO BY PAUL-HENRI CAHIER

PHOTOS BY F. PIERRE WILLIAMS

lot of people who don't believe that nowadays, but I'm not of that same thinking. I believe it's possible—if all the stars

are aligned correctly and the right situation presents itself."

Anybody know a good astrologer?—Joe Ruzs

Onboard IndyCar!

Although IndyCar's TV ratings have been less than stellar this year, the on-track action and coverage on the NBC Sports Network and ABC have been great, aided by new onboard HD cameras from Broadcast Sports Inc. that give fans an unreal view of the action. Unlike last year's cars that typically carried a single camera, the 2012 Dallara has been designed for use with them in four places: on the rollhoop (a 360-degree view), inside the right mirror, on the right endplate of the rear wing and in the right radiator duct, pointed forward at the front wheel.

All told, BSI's system, which includes cameras, microwave transmitters, receivers and bracketry, adds only 7.5 lb. to the weight of the car. If you're not one of the six cars that typically carry the cameras (it was 12 at Indy), your car will carry a dummy system with identical weight and aero to ensure nobody has an advantage. Although the cameras are very light, BSI's Doug Parr says the

wing endplate of the 2012 Dallara did have to be strengthened a bit. What's more, as rear wings occasionally need to be replaced during a race, BSI had to design a quick-disconnect capable of properly passing an HD signal, which he said was

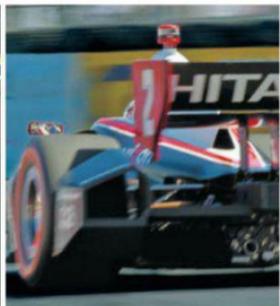
⚡ In the production trailer at each race, BSI monitors and controls the HD cameras, even rotating the rollhoop-mounted unit 360 degrees when needed to capture all the action.

a huge undertaking. "It all goes back to being involved in the development stage of the car," says Parr, who visited Dallara in Italy twice. "We've found problems and corrected them, even before the season began."—Andrew Barnhart

—Adam Cooper



PHOTOS BY BOB SPRINGER AND BILLY SWIFT



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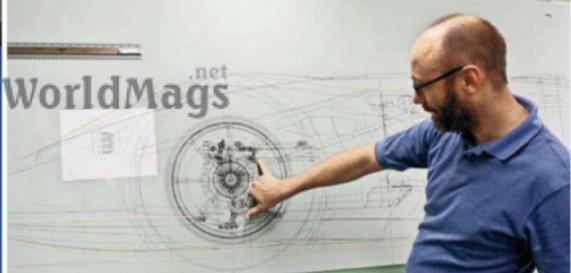
STORY & PHOTOS BY TIM CONSIDINE

As you read this, the Nissan DeltaWing, perhaps the most talked-about race car of this era, is undergoing final high-speed testing at several European tracks before its much anticipated appearance at Le Mans. If it weren't for the dogged determination of its British creator, Ben Bowby, a few forward-thinking individuals—one, an American motor-racing icon—and when it counted, Michelin and Nissan, the DeltaWing might have suffered the same fate as too many other bold,

unconventional ideas that surfaced before their time.

Not that the 45-year-old Bowby was short of experience with more conventional race cars. At Lola, where he rose to chief designer, he'd penned Champ cars, F3000 cars and sports prototypes, and after joining Chip Ganassi Racing as technical director in 2003, he oversaw successful IndyCar, Grand-Am and NASCAR programs. Regardless, by late 2008, Bowby was restless.





"I thought, 'What are we doing here? We're spec racing in everything that we do.' I was frustrated. As a design leader, I was not designing cars."

On his own, however, Bowlby was investigating an admittedly wild idea—three wheels versus four. This he tested, cleverly, with 4- and 3-wheel versions of an RC car, mounting a miniature GoPro video camera to record the results before drawing up a "virtual" 3-wheel race car, actually, two narrow tires placed close together up front with the engine and center of gravity between two wide tires at the back.

By Bowlby's calculations, the DeltaWing, so named for its long nose and triangular jet plane shape, could run the same speed as a conventional Indy car, but with half the mass, half the drag, using half the horsepower and burning half as much fuel. This kind of efficiency was in tune with the "green" direction major automobile companies were pursuing. In February 2009, Chip Ganassi was the first to see it.

"I showed him a clay model of what the car could look like and the radio-controlled electric vehicle. And he loved it and said, 'Let's do it.'"

As is now well known, the DeltaWing was initially proposed as the 2012 Indy car—and rejected, the sanctioning body opting instead for a more conventional Dallara proposal.

Undeterred, Bowlby revamped the concept as a sports prototype and began talking to others about it. One of them was Dan Gurney, no stranger to out-of-the-box thinking.

"I was kind of curious about it," Gurney remembered, "so I talked to Ben and Chip and some of the others involved."

■ DeltaWing dreams were fostered by Bowlby's RC trike, left, which proved the efficacy of the unusual design. Simon Marshall, above, looks over a full-scale drawing of the DeltaWing.

"How legitimate is the DeltaWing concept? That was where my curiosity was. The idea that maybe the internal combustion powerplant, which is part of my life, is under a certain amount of threat right now and maybe some of the aspects of the DeltaWing could allow it to compete in the 21st century, for efficiently moving people around and so forth. That appealed to my competitive juices, and so I was curious whether that could happen."

At Petit Le Mans, in October 2010, Bowlby conferred with American Le Mans Series (ALMS) founder Don Panoz and through him, met and made a presentation to ACO (Automobile Club de l'Ouest) representatives from Le Mans.

"For the first five minutes of my presentation," Bowlby remembered, "they sat around and talked amongst themselves and completely ignored us. For the second 10 minutes, they were like this (eyes wide open, in rapt attention), and then the president, Jean-Claude Plassard, stood up and said, 'Congratulations, that is the spirit of Le Mans! You must apply for the 56th Garage!'"

The DeltaWing had just been offered the ACO's special entry for an experimental car to run outside the rules for the 2012 race. It was huge, and it got Dan Gurney's attention.

"When I found out the ACO said, 'Hey, this is a great idea,' I started talking with Ben seriously."

Seeing a possible future for the DeltaWing with his green-leaning ALMS series, Panoz signed on, as did Michelin, for whom the prospect of using half the normal number of tires on a Le Mans

entry played right into their longtime "sustainable energy" campaign.

Duncan Dayton, who had Le Mans experience and whose Highcroft Racing team had won back-to-back ALMS championships in 2009 and 2010, heard about Bowlby's project at the 2011 Long Beach Grand Prix. With his Acura engine program at an end, he was immediately interested.

"I talked with Chip and he said, with all he's got going, he couldn't quarterback it anymore and asked if I'd do it for him. I said sure. I just love that it's different. I've been a student of the sport for a long time, so I know a lot about the history. And in my mind, there hasn't been a lot of innovation in the last 50 years. There's four or five really, truly innovative ideas."

"You know, Jack Brabham puts a Climax in the back of a Cooper in 1959, Jim Hall and Colin Chapman, with wings and ground effects that revolutionized the sport. And carbon fiber revolutionized the sport. But there's not been a major shift in the way sports racing cars are designed or the way they worked in decades."

"When I saw the DeltaWing, I thought, 'That's a better mousetrap,' and the way it's going with environmental concerns and the use of fossil fuels, what a great opportunity to try to extend their useful life."

With help from Panoz and Bowlby, Dayton submitted a proposal to the ACO and immediately received an official invitation. Game on.

Though no engine deal or major sponsor was in place, Dan Gurney stepped up and pledged to build the DeltaWing at All American Racers. It had been a

■ A scale model of the DeltaWing is being tested in Gurney's wind tunnel, under the supervision of aerodynamicist Hiro Fujimura. Stout rear structure mounts to the carbon tub, not the unstressed turbo Nissan engine. Bespoke gearbox is tiny, but then again, so is the DeltaWing.





❖ Work at Gurney's shop in California was rapid, in everything from suspension design and fabrication to the construction of an intricate wind-tunnel model. Phil Remington, middle photo, is an ace fabricator/mechanic who brings AAR and the DeltaWing decades of experience.

decade since they had produced a race car, but AAR was ideally suited to the task. Their facilities included state-of-the-art computer design systems, a model-making department, a functional moving-floor 1/3-scale wind tunnel, as well as skilled personnel with a wealth of experience creating bespoke race cars from the ground up. And at the helm, one of American motor racing's great risk-taking original thinkers, Ben Bowlby couldn't have found a better partner.

"It just wouldn't have happened without Dan," says Bowlby. "He has so much experience, and he certainly knows how to build a race car. He also knew if we didn't start then, it wasn't going to happen. Dan and Justin (Gurney's eldest son and AAR CEO) and the great people they provided to actually make the car really made this project possible."

In July 2011, Bowlby set up shop in a special drawing office put together over Gurney's museum at AAR. He would share this space with two AAR veterans, John Ward, who'd been responsible for the 1981 Pepsi Eagle Indy car, and aerodynamicist Hiro Fujimora, co-designer with Ward on AAR's 1992 and 1993 IMSA championship-winning Toyota Eagle Mk III. Soon they were joined by two more of Bowlby's former co-workers, Simon Marshall from Lola, and Zach Eakin from his team at Ganassi.

Thanks to Gurney, Bowlby now had an initial budget and the tools and people to turn his concept into a race car. What he didn't have was an engine. Presentations were made to a number of car companies. Only one responded, albeit cautiously at

first. In October, Nissan contracted Ray Mallock Ltd (RML), the renowned motorsports technology company in Northamptonshire, England, to build a 1.6-liter direct-injection turbocharged 4-cylinder racing engine, conveniently the same size and configuration as featured in the new Nissan Juke. Critically, however, full support for the program and the Nissan name were withheld until the radical concept could be proven viable.

More than 5000 miles apart, the DeltaWing's engine and chassis programs were underway. The two would not meet until February 2012. For Bowlby and AAR, it would be a seven-month thrash, working seven days a week, often with others coming in at night to help. And whatever the design crew came up with, AAR's expert machinists and fabricators would build on site, often aided by the legendary Phil Remington, whose wizardry played so large a role with the Scarab, Cobra and Ford GT40 programs.

"Yes," laughed Bowlby, "Here's 91-year-old Rem, still knocking things together every day, sometimes telling the younger guys, 'If you take another 30 thou off of that it'll fit better.' And of course, he's right. Amazing."

To save valuable time, a Prodrive-built central tub section from the ill-fated 2010 Aston Martin AMR-One Le Mans car was purchased. It had already passed rigorous FIA safety tests and would fit within Bowlby's specifications, which now called for a wheelbase of 120 in., 5 in. shorter than the original open-wheel version, with front and rear track measurements of 23.5 and 67 in., respectively.

❖ After the scramble to get the car finished at the AAR shop, the unverified DeltaWing finally took to the Buttonwillow track for its shakedown, with Alex Gurney at the wheel.

AAR would build everything in front of and behind the tub, with Simon Marshall responsible for the front section, John Ward the rear. Efficiency was the mantra and often the product of mixing old ideas with new technologies and new materials. And always, by "adding lightness."

In the case of Marshall's narrow front-end design, it meant carbon fiber for the chassis and a tightly packaged double A-arm coilover suspension, each shock and coil spring unit weighing only 1.6 lb. At the rear, Ward used a light, decidedly '60s-appearing space frame to support the non-stressed engine and transmission and a clever if complex suspension system that Bowlby jokingly refers to as "push me, pull you."

The suspension features pushrods, large rockers and pullrods, plus a unique vertical triangular piece that both swivels and rocks to transmit energy to the coilover shocks. It also serves as an anti-roll bar of sorts.

Zach Eakin designed a bespoke 5-speed transaxle that weighs less than 73 lb. and can be configured to run in several ways, from an open diff all the way to a torque-vectoring unit using a small electric motor.

"It's brilliant," says Bowlby, "like a limited slip, but we actually take control of the relative speed of the inside and outside wheel. Something close to it was used in the World Rally Championship but was banned because it was too good."

EMCO, who made the special narrow gears for Eakin's transmission, is one of several well-known technical partners making unique applications for the DeltaWing. The first was Michelin, who leapt at the challenge of building the 4-in.-wide 15-in. front tires, but all had



to be light, long-wearing and capable of 200 mph. Their target is to halve the number of tire changes of a conventional car at Le Mans.

The brake system is unique as well. Contrary to conventional cars, the DeltaWing has 72.5 percent of the mass and 76 percent of the aerodynamic downforce at the rear, which is where 50 percent of the brake force is applied. The whole brake package—all four corners—crafted by Friction Performance of South Carolina weighs 29.2 lb., about half the norm for a race car. By the way, that's just 2 lb. more than a single front brake assembly for a Nissan Juke.

Even the 15-in. BBS wheels are bespoke, 1-piece magnesium, forged in Japan and flown to Germany to be machined.

Aerodynamic development has, for the most part, been guided by advanced computer modeling and constant testing in the AAR wind tunnel by Hiro Fujimora. But ideas from AAR's past have also played a part. Bowly found that grafting the underbody contours and side vortex generators from John Ward's 1981 Eagle Indy car significantly improved what is commonly referred to as ground effects. The DeltaWing even has a new version of the classic Gurney flap—it moves. By default tipped up for increased downforce, it can be flattened on the straights by the driver, a Bowly-Gurney DRS, if you will.

"Why not?" asks Bowly. "We're an experimental vehicle, outside the rules."

On Tuesday, February 29, just days after the engine arrived and was installed at AAR, all the major players and a few close friends of Dan Gurney gathered at the dusty Buttonwillow track near Bakersfield, California, to witness Bowly's radical DeltaWing roll under power for the first time.

For the faithful, it was like being at Kitty Hawk over a century before, but the truth is, there were many unanswered



PHOTO BY PAUL WEBBLAN

❖ The DeltaWing looks wickered as it rolls out at Sebring, where it made some demonstration laps with Marino Franchitti at the wheel. He will be joined at Le Mans by Michael Krumm and Satoshi Motoyama. That's Ben Bowly, bottom right.

questions. Since the first announcement, inevitably, some pundits had dismissed the DeltaWing as ugly, ill-conceived and unworkable, a complete folly. Certainly, it would tip over the first time it turned, the loudest critics proclaimed—that is, if the damn thing would turn at all, with those two ridiculously skinny tires so close together at the front.

We know now it did turn, and rather well according to the three drivers who got in it over the next three days. The first of them, two-time Grand-Am champion Alex Gurney, AAR's chief tester and director of marketing, actually marveled at the car's turning ability. "It went right where I pointed it. Whatever steering input I made, it went there. It doesn't lean at all and it doesn't take a set; it just turns."

Marino Franchitti, the first driver to be announced to drive the DeltaWing at Le Mans, emphatically agreed after his stint. But perhaps the most important opinion voiced was from seven-time Le Mans veteran and Nissan contract driver Erik Comas, who was there with longtime Nissan racing engineer and consultant Ricardo Divila specifically to vet the DeltaWing prototype for Nissan.

"This is a real race car," Comas pronounced with conviction, "and we haven't even gotten close to its potential." Two weeks later, at Sebring, Nissan formally announced its full commitment.

Franchitti took a few demonstration laps, then stayed on for a week of further testing with Michael Krumm, the second driver announced for Le Mans. Both are now in Europe, for the first time running with the Nissan engine at full boost.

"We made history, Dan," a grateful Bowly told Gurney before leaving the West Coast. The next chapter, though, is yet to be written, and it will be played out on the world stage at Le Mans. But it won't be an outright victory over the likes of Audi or Toyota, cautions Bowly.

"Those guys are doing a fantastic job because they're up against the absolute limit of the regulations. They're spending an enormous amount of money, and they're doing incredible things.

"Our job is different. We're not competing for a race win, but we are showing what is possible, and so the ACO has laid down a lap time for us, 3:45, which should be about in the middle of the LMP pack. But our top speed will be similar and our cornering speed will be similar.

"The ACO has given us this opportunity to demonstrate a new approach. If we can finish the 24 hours with a little tiny stack of tires that we've used, and a couple of empty fuel drums compared to the competition, well, that's a big story...Wow! You can do this using half the fuel?"

That's Ben Bowly's game changer. 🗨️



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THE PODIUM

GUEST EDITORIAL

BY DR. WOLFGANG
ULLRICH

AS THE HEAD OF AUDI MOTORSPORT, ULLRICH HAS BEEN INSTRUMENTAL IN SHAPING AND MAINTAINING THE INGOLSTADT COMPANY'S DOMINANCE AT LE MANS SINCE 2000.

Le Mans: From Gasoline to Diesel to Hybrid

AUDI IS PROUD TO HAVE WON 10 OF THE LAST 12 24 Hours of Le Mans. After five victories with the gasoline-powered R8 race car, we switched to a turbocharged diesel in the R10 TDI for three wins, the R15 TDI for another and, last year, the R18 TDI.

In 2012, our race car again will be called Audi R18. But we have two different types: the Audi R18 e-tron Quattro, our hybrid model, and the Audi R18 Ultra, our conventionally powered model.

Audi has already applied the e-tron name to concept vehicles shown at auto shows. Some are pure electric cars, but at the 2010 Paris Motor Show we debuted the e-tron Spyder. While its rear wheels are powered by a diesel V-6, the front wheels are turned by electric power.

This is the thinking behind our 2012 R18 e-tron Quattro. In the rear, it is the same as the R18 Ultra with a 510-hp turbocharged V-6. The rules allow us to drive one axle with added electric power and we have chosen the front axle.

There are several reasons for this. One is that we think if you have the hybrid system on the front axle and the combustion engine on the rear axle, you can achieve a nice weight distribution.

We also thought there should be a small advantage in acceleration out of corners. But the rule book banned this idea by allowing us to apply the power only above 74 mph, at which point the front wheels are nearly already straight. This is why I say that, at present, the R18 e-tron is a "part-time Quattro" by rule.

We also had to look into the possibilities of

storing energy, as it is important to get it quickly into the system and quickly get it out again. The battery concept was one of the first, but we knew that for us it is not the way to go. Looking into different possibilities, the choices were the capacitor and the flywheel. We decided to go for the flywheel because we think that it is overall the better concept.

We had already decided in a 2008 concept study to use a flywheel if we would develop a hybrid. It is true that we developed the flywheel with the same company Porsche purchased theirs from, but our space and weight demands are completely different. Our flywheel system is about 14 in. in diameter and 16 in. high. The weight of the whole system including the flywheel, the electrical stuff, the front drive motor/generator and driveshafts is about 165 lb.

With its structural casing, the flywheel is a proven, safe energy storage. We are often asked if there is any gyroscopic effect from the flywheel. There is a small one, but it is of no relevance to motor racing.

We will go to Le Mans with two different concepts because as before, we still see potential in the conventional drive—just as our colleagues in production development do. Other than the flywheel system, the R18 e-tron Quattro and the R18 Ultra are the same. The most difficult part of the project was to find 165 lb. we could remove from the already lightweight R18 for the weight of the hybrid system. The advantage of the Ultra is that we now can position this ballast for better weight distribution.

Beyond racing, I know our development people are working on similar concepts, and I am sure that they will be able to use what we learn at the racetrack.

"The most difficult part of the project was to find 165 lb. we could remove from the already lightweight R18 for the weight of the hybrid system."



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TECH ADVICE

BY TOM WILSON

Mirror, Mirror, on the Fender?

MIRROR MOUNTING: When my old Porsche 911 was new, a factory delete option did away with the door-mounted outside rearview mirror. Instead, I installed a Talbot mirror mounted on the fender, by the gas filler door. Every time I drive the car I appreciate the advantages of this configuration. I don't have to avert my view through the windshield, the blind spot is reduced and no head turning is required. The Japanese manufacturers seem to offer this configuration too but I don't see it used elsewhere. Given its apparent advantages, one wonders why not?

Rudolf Boentgen
Boston, Massachusetts

Legislation is the main driver of exterior rearview mirror

design from what we can determine. We've questioned what we perceive as overly large mirrors that hinder outward vision and have been told European legislation requires them and it's too expensive to have one mirror for Europe and another for North America, so we all get the large mirrors.

In fact, the fender-mount mirrors you champion are legislated by Japanese regulations, so you see them there. But those mirrors can't meet the rules in Europe and the Americas, so they remain a Japanese characteristic.

PICKUP AND ROLLOVER: Do pickup trucks have to comply with the same safety requirements as a conventional passenger vehicle?

I am especially concerned about rollover protection. We passed an accident on our way home, a newer model pickup rolled over and the cab was completely flattened. It was a grim scene. So, are the requirements the same for these two classes of vehicles?

George Hauptman
Malibu, California

Generally, yes. Since 1991, Standard 216 of the Federal Motor Vehicle Safety Standards has required light trucks up to 6000 lb. to meet the same rollover crush standards as passenger cars (excluding convertibles). That standard called for a survivable space for a midsize adult male after a rollover force of 1.5 times the vehicle's weight.

However, the rollover stan-

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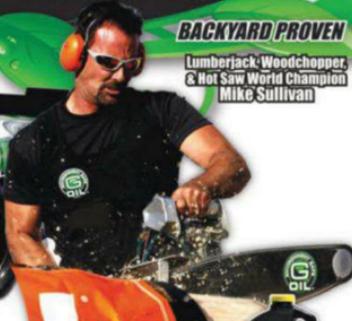


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dards are increasing to include up to 10,000-lb. trucks starting this year, with full implementation by 2015. Additionally, the test forces are going up to three times the vehicle's empty weight for cars and trucks weighing less than 6000 lb., and over the years there have been several changes to the details of the testing to make it much more realistic.

As you have witnessed, even with such standards it's still possible to crush roofs given a running start. A relatively new strategy is requiring stability control in cars and trucks starting this year. The idea is to prevent rollovers in the first place via superior vehicle control.

DRL RANT: Has anyone noticed the proliferation of drivers who travel well into darkness with only the daytime running lights on? Why are they wired to light only the front and not the taillights? I have actually spoken to several people who thought they had automatic lights and had no idea they were driving with no taillights. Far too large a percentage of the cars on the road in America are piloted by drivers who are clueless about their car's functions and features.

It seems that with the advent of all the safety devices, i.e., airbags, antilock, stability control, lane departure, etc., the DRLs could have been made more idiot-proof. I would think it would be cheaper and easier to have all the lights come on all the time, like a motorcycle. This is driving me nuts. Can you enlighten me?

Mike Weldon
Fishers, Indiana

Don't get us started, Mike, but the "dumb-bell simple" school of thought has been winning in public driving policy for decades.

Daytime running lights are supposed to be just that, anti-collision lights for daytime, so they need not be quite as bright as headlights and there is no need for taillights, as illuminated taillights during the day might be mistaken for, or reduce contrast with, brake lights. Thus, DRLs do not simply activate both headlights and taillights.

Our take on DRLs is if they are such a good idea, then all cars should have them... and when all cars have them, DRLs will just notch up the visual "noise" level. Already they take away from identifying motorcycles—which can afford to stand out in a crowd—and we find glaring lights a major nuisance day or night.

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TECH TIDBITS

BY DENNIS SIMANAITS
ENGINEERING EDITOR

Automotive Design—and Gargoyles

IMAGINE AN ARTISAN CRAFTING A GARGOYLE destined to reside on the Cathédrale Notre Dame de Paris. The object has a clear function, to divert rainwater from the masonry walls, but it's also a work of art—one that'll only rarely be admired once it's in place some 200 ft. above the street.

Curiously enough, the same can be said for elements of automobile design. Among these are brackets supporting the dashboard of the classic British Invicta. More than just functional castings, these brackets are also artfully



crafted to spell out the name of the car—only to be subsequently embedded in coachwork and never seen again.

Until an Invicta is being restored—as is the case with our pals at the Academy of Art University Automobile Museum. For details of this neat venue, see its Ampersand coverage elsewhere in this issue. Also, by the way, had you attended last year's San Francisco International Auto Show, you might have seen the disassembled 1931 Invicta 4½-Litre as part of the university's 36-car exhibit.

Invictas were known for their stamina rather than outright speed. Competition successes included an overall win in the 1931 Monte Carlo Rally, the driver, a young man named Donald Healey. Yes, that Healey.



A GARGOYLE TIDBIT: I never know where my Tidbits research will lead, and it's certainly fun to stumble on things. It turns out the Notre Dame gargoyles aren't ones dating back to the cathedral's high Gothic construction, 1163–1345. Medieval originals, along with many other religious artifacts, were destroyed during the French Revolution. A major restoration of the cathedral, 1843–1864, brought new fresh creations into place. There's a scholarly book on the subject: *The Gargoyles of Notre-Dame: Medievalism and the Monsters of Modernity*, by Michael Camille; University of Chicago Press, 2008.

DEFEATING PIRANHAS—AND MAKING BETTER GLASS: It's quite possible that a sturdy Amazonian fish might well lead to better chip-resistant automotive windshields. The arapaima, a 400-lb. lungfish, shares Amazonian rivers and lakes with piranhas, the latter known for swarming and devouring just about anything. However, it's not the arapaima's size that protects it; instead, the piranha's teeth are literally shattered by this fish's supertough armored scales. What's more, according to *Science* magazine, Vol. 335, 17 February 2012, published by the American Association for the Advancement of Science, biomimicry of these scales can be applied to form crack-resistant materials.

The arapaima's scales are two-ply, with a tough but springy collagen (think tendons and ligaments) covered by a hard shell of collagen fibers cemented with calcium. It's the hard-on-soft pattern that gives toughness and keeps damage from spreading.

BATTERY RECYCLING: Though they're located in nearby Anaheim, California, I hadn't heard of the Kinsbursky Bros. until recently. Working together with Toyota, their company is proof that we won't be surrounded by landfills of dead batteries.

Toyota hybrid batteries are engineered to last seven to 10 years and 150,000–300,000 miles. In fact, the California Air Resources Board requires 150K durability. What's more, as a sample of one, a friend's first-generation Prius has traveled more than 200K on its original battery pack.

Nickel/metal-hydrate packs don't fall abruptly. But when they do ultimately tire, they're shipped to Kinsbursky where every piece is recycled. The most valuable assets are the nickel and rare-earth elements, though even shells and plastic housings are processed. The company can recycle lithium-ion batteries as well.

A new battery pack currently retails for \$2589, about the cost of an ordinary engine rebuild. It's not out of the norm for dealers to install new packs in used cars to be resold.

PULL OVER! AND WHERE'S YOUR TAX RECEIPT?:

According to reports in *The New York Times*, tax evasion has been something of a national sport in Italy. As one example, nearly half the boats larger than 35 ft. are registered to people declaring income of less than \$26,000 per annum. The Agenzia delle Entrate, Italy's IRS, verified in 2011 that 2806 owners of luxury automobiles failed to declare sufficient income to support such enthusiasm. Spot checks have cropped up as well. *The Times* reports "a wake of sulky entrepreneurs and petulant car owners."

It's estimated that the equivalent of \$150 billion has been scammed each year in undeclared income. But no longer; tax officials are apparently taking on their responsibilities *con brio*.

"Many aspects of car design are right out there. Others may be harder to see, but no less artful."

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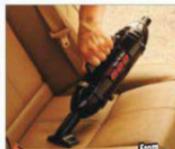
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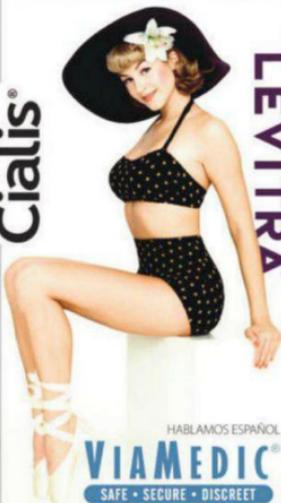


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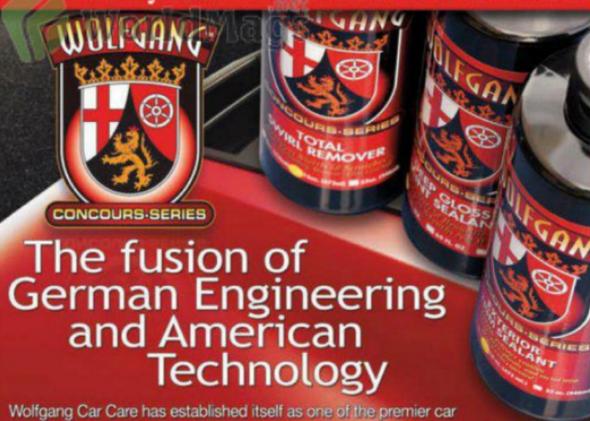
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Quality Tools at Ridiculously Low Prices

LIFETIME WARRANTY
ON ALL HAND TOOLS!

FACTORY DIRECT TO YOU!

How does Harbor Freight Tools sell high quality tools at such ridiculously low prices? We buy direct from the factories who also supply the major brands and sell direct to you. It's just that simple! See for yourself at one of our 390 Stores Nationwide and use this 20% Off Coupon on one of our 7,000 products*, plus pick up a Free 9 LED Aluminum Flashlight, a \$6.99 value. We stock Shop Equipment, Hand Tools, Tarps, Compressors, Air & Power Tools, Woodworking Tools, Welders, Tool Boxes, Generators, and much more.

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- No Hassle Return Policy!
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Nobody Beats Our Quality, Service and Price!

FREE!
WITH MINIMUM PURCHASE OF \$8.99

3-1/2" SUPER BRIGHT NINE LED ALUMINUM FLASHLIGHT
ITEM 65020/69052/69111
REG. PRICE \$6.99

Item 65020 shown

HARBOR FREIGHT TOOLS - LIMIT 1 Free flashlight available with qualifying minimum purchase including one of any other discount or coupon. Coupon not valid on prior purchases after 20 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store or with your order form, or entered online in order to receive the coupon. Valid through 10/31/12. Limit one coupon per customer and one coupon per day.

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HARBOR FREIGHT TOOLS - LIMIT 1 Use this coupon to save 20% on any one single item purchase after pickup at a Harbor Freight Tools store. *Cannot be used with any other discount or coupon. Coupon not valid on any other discount or coupon. Coupon not valid on prior purchases after 20 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store or with your order form, or entered online in order to receive the coupon. Valid through 10/31/12. Limit one coupon per customer and one coupon per day.

CENTECH AUTOMATIC BATTERY FLOAT CHARGER
LOT NO. 42282/69594
REG. PRICE \$12.99

Item 42282 shown

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PITTSBURGH TORQUE WRENCHES
1/4" DRIVE LOT NO. 2696
3/8" DRIVE LOT NO. 807
1/2" DRIVE LOT NO. 239

SAVE 71%

YOUR CHOICE! REG. PRICE \$999
REG. PRICE \$34.99
SAVE \$954.01

ACCURACY WITHIN 1/4%

HARBOR FREIGHT TOOLS - LIMIT 6 This valuable coupon is good anywhere you shop Harbor Freight Tools retail stores, online, or 800 number. Cannot be used with any other discount or coupon. Coupon not valid on prior purchases after 20 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store or with your order form, or entered online in order to receive the coupon. Valid through 10/31/12. Limit one coupon per customer and one coupon per day.

6" DIGITAL CALIPER PITTSBURGH
LOT NO. 47257

Item 30846 shown

SAVE 66%

Includes two 1.5V batteries

\$999 REG. PRICE \$29.99

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PITTSBURGH 3 TON HEAVY DUTY JACK STANDS
LOT NO. 38846/69597

Item 38846 shown

SAVE 54%

\$1599 REG. PRICE \$34.99

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MECHANIC'S GLOVES
LARGE LOT NO. 93640
X-LARGE LOT NO. 93641

SAVE 50%

YOUR CHOICE! REG. PRICE \$399
REG. PRICE \$7.99

HARBOR FREIGHT TOOLS - LIMIT 7 This valuable coupon is good anywhere you shop Harbor Freight Tools retail stores, online, or 800 number. Cannot be used with any other discount or coupon. Coupon not valid on prior purchases after 20 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store or with your order form, or entered online in order to receive the coupon. Valid through 10/31/12. Limit one coupon per customer and one coupon per day.

RECIPROCATING SAW WITH ROTATING HANDLE CHICAGO ELECTRIC TOOLS
LOT NO. 65570

Item 65570 shown

SAVE 50%

\$1999 REG. PRICE \$39.99

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ADJUSTABLE SHADE AUTO-DARKENING WELDING HELMET CHICAGO ELECTRIC WELDING
LOT NO. 46092

Item 46092 shown

SAVE 50%

\$3499 REG. PRICE \$69.99

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HaulMaster MOVER'S DOLLY
LOT NO. 93888

Item 93888 shown

SAVE 46%

1000 LB. CAPACITY \$799 REG. PRICE \$14.99

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2.5 HP, 21 GALLON, 125 PSI VERTICAL AIR COMPRESSOR CENTRAL PNEUMATIC
LOT NO. 67847/69091

Item 67847 shown

SAVE \$70

\$14999 REG. PRICE \$219.99

HARBOR FREIGHT TOOLS - LIMIT 4 This valuable coupon is good anywhere you shop Harbor Freight Tools retail stores, online, or 800 number. Cannot be used with any other discount or coupon. Coupon not valid on prior purchases after 20 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store or with your order form, or entered online in order to receive the coupon. Valid through 10/31/12. Limit one coupon per customer and one coupon per day.

3/8" x 25 FT. HEAVY DUTY RETRACTABLE AIR HOSE REEL CENTRAL PNEUMATIC
LOT NO. 46164

Item 46164 shown

SAVE 42%

\$3999 REG. PRICE \$69.99

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RAPID PUMP® 3 TON HEAVY DUTY FLOOR JACK PITTSBURGH
Item 68048 shown

SAVE \$70

\$6999 REG. PRICE \$139.99

WEIGHS 74 LBS.

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SUPER COUPON!

29 PIECE TITANIUM NITRIDE COATED DRILL BIT SET
drillmaster

LOT NO. 5889

SAVE 60% **\$999** REG. PRICE \$24.99



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SUPER COUPON!

World's BEST MULTI-USE TRANSFER PUMP
PITTSBURGH

LOT NO. 66416

SAVE 69% **\$399** REG. PRICE \$12.99



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SUPER COUPON!

SAVE 52%

4 PIECE 1" x 15 FT. RATCHETING TIE DOWN SET

LOT NO. 90984

\$799 REG. PRICE \$16.99



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SUPER COUPON!

LOT NO. 66699
 4119/69295

12 FT. 8 GAUGE HEAVY DUTY BOOSTER CABLES
PITTSBURGH

SAVE 50% **\$999** REG. PRICE \$19.99



HARBOR FREIGHT TOOLS - LIMIT 6
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SUPER COUPON!

CENTRAL PNEUMATIC DUAL CHUCK TIRE INFLATOR

LOT NO. 68272

SAVE 42% **\$399** REG. PRICE \$6.99



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SUPER COUPON!

15" x 13" ALL PURPOSE SHOP TOWELS - PACK OF 50

LOT NO. 48163
 68442/89649

SAVE 46% **\$799** REG. PRICE \$14.99



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SUPER COUPON!

5 PIECE AUTO TRIM AND MOLDING TOOL SET

LOT NO. 67021

SAVE 61% **\$499** REG. PRICE \$12.99



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SUPER COUPON!

4-1/2" ANGLE GRINDER drillmaster

LOT NO. 95578

SAVE 50% **\$999** REG. PRICE \$19.99



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SUPER COUPON!

WIRELESS DRIVEWAY ALERT SYSTEM

Bunker Hill Security
 LOT NO. 93068/69590

SAVE 53% **\$1399** REG. PRICE \$29.99



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SUPER COUPON!

CAN OBDII CODE READER WITH MULTILINGUAL MENU
CENITECH

LOT NO. 90566

SAVE 38% **\$4299** REG. PRICE \$69.99



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SUPER COUPON!

27 LED PORTABLE WORKLIGHT/FLASHLIGHT
GORDON

LOT NO. 67227/69567

SAVE 50% **\$299** REG. PRICE \$6.99



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SUPER COUPON!

PNEUMATIC ADJUSTABLE ROLLER SEAT
US+GENERAL

LOT NO. 46319

SAVE 33% **\$1999** REG. PRICE \$29.99



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SUPER COUPON!

18 VOLT CORDLESS 3/8" DRILL/DRIVER AND FLASHLIGHT KIT
drillmaster

LOT NO. 68287

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SUPER COUPON!

ESPECIALLY DESIGNED MIG-FLUX WELDING CART
LOT NO. 90305

SAVE 41% **\$3499** REG. PRICE \$59.99



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SUPER COUPON!

700 LB. CAPACITY

FIVE DRAWER TOOL CART
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LOT NO. 95272/69397

SAVE \$130 **\$16999** REG. PRICE \$299.99



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1991 BENTLEY CONTINENTAL CONVERTIBLE



Completely original and magnificent Dark Oyster body with beautiful dark brown Everflex top, leather, carpets, Mouton carpet overlays and fabulous interior inlaid walnut with cocktail requisites to both doors. Delivered new in Munich, Germany, brought to the U.S. by the fellow from whom we purchased it and then sold to a local collector. 23,217 miles. \$125,000.

1929 PACKARD EIGHT "633" RUMBLESEAT ROADSTER



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1973 JAGUAR XKE-V/12 ROADSTER



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ROAD TEST SUMMARY

ROAD TEST LEADERBOARD

	0-60 MPH	SEC
1 Bugatti Veyron 16.4 Super Sport		2.5
2 Porsche 911 Turbo S		2.6
3 Lamborghini Aventador LP700-4		2.7
4 Nissan GT-R		3.0
5 Ferrari 458 Italia		3.0

	1/4 MI	SEC @ MPH
1 Bugatti Veyron 16.4 Super Sport		9.9 @ 145.8
2 Lamborghini Aventador LP700-4		10.4 @ 136.0
3 Saleen S7 Twin Turbo		10.6 @ 139.8
4 Porsche 911 Turbo S		10.7 @ 128.9
5 Lamborghini Gallardo Superleggera		11.0 @ 129.9

	SKIDPAD	9
1 Dodge Viper SRT10 ACR		1.12
2 Chevrolet Corvette Z06		1.07
3 Rossion Q1		1.06
4 Lamborghini Aventador LP700-4		1.05
5 Chevrolet Corvette ZR1		1.05

	SLALOM	mph
1 Chevrolet Corvette Z06		77.2
2 Chevrolet Corvette ZR1		76.2
3 Porsche 911 GT3 RS		75.9
4 Porsche 911 GT3 RS 4.0		75.8
5 Nissan GT-R		75.0

Data apply to the model at the time (issue date) of testing. Legend: For engine types, I is an inline design, F is a flat, V an V; W describes cylinder configurations; the number following the letter is the number of cylinders. An additional letter, "a" or "s," designates turbo- or supercharging; "d" designates diesel; "E" designates fuel cell; "Elec" designates electric motor; **boldface**—extremes in that particular category, excluding nonproduction cars; **yellow** = newest entries; **na** = not available, **na/U.S.** = "CL" Car Life magazine; **automatic**; transmission; **comparison** tests; **price** at time of test, some estimated; **estimated**; **electronically limited**; **"0/100** lbs; **automated manual transmission**; **altitude-affected**; **zero-limited**; **Road Test Update**; **mpg** equivalent.

INTERPRETING THE NUMBERS: Factors that affect test numbers include air temperature, barometric pressure, condition of track surface, time of test car. When comparing cars' performance, look for the **significant differences** in each category, as listed below. This is the amount of difference that is meaningful.

WEIGHT of a car is generally accurate to **within 1 percent**.

ACCELERATION numbers are obtained using drop-chute starts and 1/8-throttle shifts.

Significant difference: 0-60 mph, 0.2 sec.; 1/4 mile, 0.5 sec.

TOP SPEED is typically as reported by the manufacturer, but occasionally we measure it on a closed test track.

Significant difference: 5.0 mph.

BRAKING distances are initiated when the pedal is touched, and just enough effort is used to avoid wheel locking; on cars equipped with anti-lock braking systems, the ABS is fully involved.

Significant difference: 50-0 mph, 10 ft.; 80-0 mph, 15 ft.

HANDLING is quantified two ways: The skidpad measures steady-state cornering g around a 200-ft.-diameter circle (run in both directions). The slalom, run through eight cones spaced at 100-ft. intervals, samples both controllability and g during transient handling.

Significant difference: Skidpad, 0.02g; slalom, 1.0 mph.

Our FUEL MILEAGE is measured simply during a bar-braking and typically falls between EPA's city and highway estimates.

Significant difference: 0.5 mpg.



MAKE & MODEL	ISSUE	PRICE AS TESTED*	ENGINE TYPE	HORSEPOWER, SALE	TORQUE, LB-FT	0-100 MPH, SEC	1/4 MILE, SEC @ MPH	TOP SPEED, MPH†	BRAKING 60-0 MPH, FT	BRAKING 80-0 MPH, FT	SKIDPAD, G	SLALOM, MPH	OUR FUEL MILEAGE, MPG		
Acura TL SH-AWD	5-10*	\$44,195	V-6	305	273	3960	5.2	131	137 @ 102.3	130†	113	198	0.91	68.4	15.8
Aston Martin Rapide†	9-10	\$212,445	V-12	470	443	4385	4.7	10.9	131 @ 109.5	188	119	204	0.92	66.7	12.0†
V8 Vantage S†	8-11*	\$157,670	V-8	430	361	3645	4.3	9.8	127 @ 113.7	198	116	204	0.97	73.7	15.0†
V12 Vantage Coupe	1-1†	\$193,755	V-12	510	420	3800	4.3	9.3	125 @ 116.8	190†	106	187	0.96	73.7	13.4
Audi A7 3.0†	5-12†	\$66,220	V-6	310	325	4250	5.7	11.9	132 @ 105.0	140	115	206	0.93	68.0	19.3
AB1†	10-1†	\$88,375	V-8	372	328	4495	4.0	12.6	136 @ 104.0	130†	112	197	0.95	69.9	18.0
R8 5.2 FSI	1-1†	\$170,350	V-10	525	391	3725	3.7	8.4	119 @ 118.7	136	112	199	0.99	72.9	13.6
S4 Quattro	8-11*	\$55,500	V-6	335	325	3965	4.4	11.0	12.9 @ 108.8	159	118	205	0.95	68.4	18.4
TT RS	1-12	\$61,255	I-5	360	343	3360	4.0	10.6	12.6 @ 109.6	174	123	217	0.95	70.7	19.0†
Bentley Continental GT†	7-11*	\$215,675	W-12tt	567	516	5305	4.3	10.4	12.8 @ 111.3	198	117	207	0.98	65.4	13.0†
Continental Supersports Conc.†	11-11	\$298,590	W-12tt	612	590	5515	3.9	10.1	12.5 @ 110.1	202	117	210	0.99	66.6	13.0†
BMW Z4 sDrive35i†	8-11*	\$64,225	I-6tt	335	332	3555	4.4	10.6	12.9 @ 109.9	155	119	208	0.98	68.8	20.0
1 Series M Coupe	9-1†	\$50,460	I-6tt	335	332	3405	4.4	10.8	12.9 @ 108.4	155	117	204	0.95	73.4	19.4
328i†	6-12†	\$50,870	I-4	240	255	3605	5.4	14.1	13.9 @ 99.5	155	124	219	0.98	69.0	15.8
528i†	4-12†	\$58,775	I-4	240	260	3950	5.9	15.6	14.4 @ 96.3	130	122	217	0.88	64.4	24.0†
650i	4-12†	\$97,825	V-8tt	400	450	4380	5.1	14.4	14.0 @ 107.6	155	119	212	0.94	66.8	15.6
Bentley Veyron 16.4 Super Sport†	11-11	\$2,765,840	W-16tt	1106	655	4,245	2.5	4.9	9.9 @ 145.8	258†	124	212	0.99	69.6	9.0†
Bugatti Veyron 16.4	12-11*	\$38,500	I-4	270	295	3785	6.2	15.6	14.7 @ 99.0	152	119	208	0.90	63.6	20.0†
Buick Regal GS	1-12†	\$26,850	I-4	180	171	3400	7.9	21.3	16.0 @ 87.9	118†	131	233	0.63	65.3	23.0†
Cadillac CTS-V Sedan	8-11*	\$69,490	V-8	556	551	4300	4.1	9.2	12.3 @ 114.8	191	114	198	0.92	70.1	15.2
Chevrolet Camaro ZL1	3-12†	\$54,995	V-8	580	556	4080	4.7	10.2	12.9 @ 113.1	180	118	204	0.98	72.9	14.0†
Corvette	4-12†	\$63,480	V-8	436	428	3325	4.3	9.3	12.5 @ 116.9	190	126	221	0.92	66.7	18.4
Corvette Convertible	4-12†	\$70,395	V-8	430	424	3380	4.4	9.8	12.7 @ 114.8	185	125	219	0.94	67.7	20.0†
Corvette Grand Sport	4-12†	\$72,130	V-8	436	428	3430	4.0	9.1	12.3 @ 115.6	190	112	192	0.99	71.4	16.9
Corvette Grand Sport Conv.	4-12†	\$78,140	V-8	436	428	3440	4.2	9.5	12.5 @ 114.8	185	110	195	0.99	70.7	18.3
Corvette Z06	4-12†	\$101,760	V-8	505	470	3310	3.6	7.9	11.7 @ 124.1	198	103	176	1.07	77.2	16.5
Corvette ZR1	4-12†	\$129,945	V-8s	638	604	3405	3.5	7.3	11.5 @ 129.0	205	104	175	1.05	76.2	11.9
Cosco LTZ	6-12†	\$18,695	I-4	138	148	2825	7.8	23.6	16.2 @ 86.9	125	126	223	0.84	69.4	29.4
Volk†	2-11†	\$43,485	I-4/Elec	149	273	3825	8.8	28.1	16.8 @ 82.8	107	127	251	0.79	62.6	50.0†
Chevrolet 300 SRT8†	12-11	\$57,725	V-8	470	470	4430	4.5	10.6	12.9 @ 111.6	175	120	217	0.92	66.2	14.6
Dodge Avenger RT†	6-12†	\$27,440	V-6	283	260	3630	6.2	15.8	14.7 @ 96.5	118†	134	238	0.84	61.5	20.0†
Challenger SRT8 392	5-1†	\$44,380	V-8	470	470	4350	4.6	10.8	13.0 @ 109.8	180	117	198	0.90	68.7	15.0
Viper SRT10 ACR	4-08*	\$98,110	V-10	600	560	3630	3.4	8.0	11.6 @ 122.6	177	109	187	1.02	73.4	na
Ferrari California†	2-10	\$200,822	V-8	453	358	3925	3.3	8.6	11.9 @ 116.9	193	106	188	0.96	69.2	14.0†
Enzo†	7-03	\$652,830	V-12	650	485	3230	3.3	6.6	11.1 @ 135.0	218	109	188	1.01	73.0	13.3
458 Italia†	12-10†	\$280,572	V-8	570	398	3940	3.6	6.7	11.0 @ 128.5	203	112	190	1.00	73.4	13.5
Ford Focus Abarth	6-12†	\$26,050	I-4	160	170	2590	6.6	17.5	15.1 @ 92.5	129	129	234	0.85	70.2	29.2
Ford Focus Hatchback†	9-11*	\$25,830	I-4	160	146	315	8.1	22.2	16.1 @ 86.9	118	110	219	0.99	69.2	28.8
GT	12-03	\$150,525	V-8	500	500	3390†	3.8	8.8	12.2 @ 121.6	190	117	199	0.99	69.5	15.0†
Mustang Boss 302LS	5-11	\$47,990	V-8	444	380	3690	4.1	9.1	12.3 @ 117.2	155	112	191	1.02	74.0	16.7
Mustang GT Convertible	7-1†	\$42,585	V-8	412	390	3745	4.9	10.8	13.1 @ 110.7	145	116	203	0.91	68.1	17.0
Shelby GT500	8-11*	\$55,330	V-8	550	510	3870	4.3	8.9	12.4 @ 119.4	155	116	198	1.01	69.9	14.4
HKS Nissan GT-R†	10-10†	\$107,000	V-6tt	638	606	3900	3.0	6.8	11.1 @ 128.9	195	122	205	0.97	73.8	na
Honda Accord V6EX-L Coupe	1-11†	\$32,480	V-6	271	251	3475	6.2	15.7	14.8 @ 96.8	130†	138	225	0.84	62.9	16.0†
Civic Si Coupe	10-11†	\$23,175	I-4	201	170	2905	6.7	16.6	15.0 @ 95.3	137	134	237	0.88	68.0	23.0†
Hyundai Equus Signature†	10-11†	\$58,900	V-8	385	333	4610	6.1	15.0	14.6 @ 98.6	149	128	229	0.80	64.2	16.2
Sonata Hybrid†	8-11†	\$31,650	I-4/Elec	203	193	3650	8.7	22.8	16.6 @ 86.2	123	157	247	0.78	63.6	36.0†
Sonata SE 2.0†	4-11†	\$25,000	I-4	274	269	3640	6.1	14.6	14.5 @ 99.6	146	131	231	0.85	65.9	23.0†
Infiniti G37†	4-11†	\$34,225	V-6	218	187	3515	7.5	19.5	17.9 @ 90.2	145	124	223	0.87	65.9	21.0†
Infiniti G37S Sport	5-10†	\$40,085	V-6	328	269	3665	5.1	12.5	13.6 @ 105.6	149	117	210	0.90	68.6	16.6
MS6†	1-1†	\$68,145	V-8	420	417	3930	4.6	11.0	13.1 @ 108.7	155	121	214	0.87	66.7	17.9
Jaguar XFR†	6-11-1*	\$80,475	V-8	510	461	4425	4.3	9.7	12.6 @ 114.0	155	116	204	0.96	69.2	17.1
XJL Supercharged†	10-11†	\$91,950	V-8	470	424	4395	4.4	10.3	12.8 @ 111.1	155	114	205	0.96	65.9	14.1
XKR-5†	3-12	\$132,875	V-8s	542	502	4100	4.2	8.6	12.3 @ 121.0	186†	117	203	0.91	70.7	13.0
Kia Optima Hybrid†	11-11†	\$32,520	I-4/Elec	206	195	3715	8.6	23.5	16.6 @ 86.0	123	135	246	0.79	62.9	36.0†
Optima Turbo†	5-11†	\$30,840	I-4	274	269	3595	6.1	14.7	14.5 @ 99.4	146	135	239	0.81	65.6	23.0†
Lamborghini Aventador†	5-12	\$406,905	V-12	691	509	3795	2.7	5.8	10.4 @ 136.7	217	108	19			

MAKE & MODEL	ISSUE	PRICE AS TESTED*	ENGINE TYPE	HORSEPOWER, SAE	TORQUE, LB-FT	0-60 MPH, SEC	0-100 MPH, SEC	1/4 MI. SEC @ MPH	TOP SPEED, MPH	BRKING 50-0 MPH, FT	BRKING 80-0 MPH, FT	SUDDEN 0	SLALOM, MPH	OUR FUEL MILEAGE, MPG
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Mercedes-Benz C200 Sport 6-12 th	\$41,880	1-4t	201	229	3535	6.4	16.7	14.8 @ 94.4	130 ¹	117	206	0.91	69.1	17.4
CL55 AMG ¹	\$130,290	V-8st	550	590	4275	3.8	8.3	12.0 @ 122.5	186	116	204	0.93	70.3	16.0 ¹
E63 AMG	\$93,075	V-8	518	465	4265	4.1	9.5	12.5 @ 115.1	155 ¹	119	207	0.92	69.2	15.0 ¹
E550	\$69,625	V-8	382	391	4150	4.6	11.3	13.3 @ 102.9	130 ¹	120	212	0.86	63.1	17.4
F Cell	\$849,910	FC	314	214	3850	9.1	na	17.1 @ 81.2	101	123	225	0.81	62.6	48.4
SL63 AMG ²	\$143,460	V-8	518	465	4420	4.0	9.5	12.4 @ 115.3	186 ¹	120	211	0.89	66.6	10.0
SL65 AMG/Black Series ¹	\$304,350	V-12tt	661	738	4215	3.9	7.9	11.8 @ 126.3	199 ¹	112	192	0.99	70.3	14.2
SLR McLaren ¹	\$455,750	V-8	617	575	3860	3.5	7.5	11.5 @ 126.1	207	107	186	0.97	69.6	18.0 ¹
SL55 AMG Roadster ²	\$242,675	V-8	563	479	3915	3.5	7.6	11.5 @ 125.3	197 ¹	116	201	0.98	71.9	13.9
Mini Cooper S ¹	\$29,700	1-4t	181	177	2275	6.0	16.1	14.6 @ 95.7	139 ¹	119	208	0.90	68.4	28.1
Cooper S Coupe	\$32,150	1-4t	181	177	2260	6.6	17.1	15.0 @ 93.8	139 ¹	119	208	0.92	70.7	26.7
Mini JCW Clubman	\$35,350	1-4t	208	192	2815	6.2	15.7	14.8 @ 96.9	147 ¹	122	215	0.87	69.3	28.0
Mitsubishi Eclipse GT	\$27,694	V-6	263	260	3570	5.9	14.7	14.5 @ 99.3	148	121	217	0.84	63.9	19.6
Lancer Evolution CSR	\$34,755	1-4t	291	300	3600	4.3	11.5	13.0 @ 106.2	162 ¹	123	210	0.97	70.0	16.5
Lancer Evolution SE²	\$36,550	1-4t	291	300	3625	4.5	12.0	13.2 @ 104.3	162 ¹	119	207	0.92	70.2	15.0 ¹
Lancer Ralliart¹	\$29,915	1-4t	237	253	3540	5.4	15.1	14.1 @ 97.3	130 ¹	129	227	0.84	66.7	17.3
Nissan GT-R¹	\$95,280	V-6gt	545	463	3890	3.0	7.1	11.2 @ 125.0	193	116	197	0.97	75.0	12.0 ¹
Juste SV	\$21,810	1-4t	188	177	2925	7.1	18.6	15.6 @ 91.4	125 ¹	133	238	0.84	63.3	25.0 ¹
Leaf SL-E¹	\$35,430	Elec	107	207	3415	9.4	na	17.2 @ 79.0	92 ¹	130	231	0.85	65.5	na ¹
Maxima 3.5 SV¹	\$34,940	V-6	290	261	3610	6.1	15.4	14.6 @ 97.7	149 ¹	121	219	0.86	65.4	18.8
Nismo 370Z	\$39,540	V-6	350	276	3300	5.0	12.0	13.5 @ 106.6	155 ¹	123	214	0.93	69.9	19.0 ¹
370Z Touring	\$41,895	V-6	332	270	3425	4.9	11.9	13.4 @ 106.8	155 ¹	118	201	0.99	72.0	18.6
Porsche Boxster Spyder	\$67,820	V-6	320	275	3000	4.4	10.4	12.8 @ 109.2	166 ¹	111	196	1.01	74.2	21.0
Carrera GT	\$460,400	F-10	605	435	3500 ¹	3.6	7.0	11.3 @ 131.6	205	124	199	0.99	71.1	11.0 ¹
Cayenne S¹	\$78,895	V-8	400	369	4555	5.6	14.1	14.1 @ 100.1	160 ¹	116	200	0.89	66.2	15.0
Cayman R	\$81,685	V-6	330	273	3025	4.4	10.2	12.8 @ 110.5	175	114	200	0.97	71.3	21.7
Panamera S Hybrid¹	\$110,240	V-6/F-380	428	4485	4.9	12.4	13.5 @ 103.9	167	118	208	0.93	70.1	23.0 ¹	
Panamera Turbo S¹	\$186,845	V-8st	550	553	4575	3.4	8.1	11.6 @ 120.8	190	110	207	0.99	69.6	16.0 ¹
911 Carrera GT S¹	\$113,605	F-6	408	310	3380	3.8	9.0	12.1 @ 115.4	188	109	192	0.95	72.6	21.9
911 Carrera S¹	\$119,290	F-6	400	325	3120 ¹	3.5	8.4	11.8 @ 118.4	189	111	197	0.91	74.1	20.0 ¹
911 GT2 RS	\$260,980	F-6tt	620	516	3230 ¹	3.5	7.1	11.3 @ 130.5	205	111	187	1.02	75.9	17.0 ¹
911 GT3 RS 4.0	\$198,280	F-6	494	339	3125	3.6	8.0	11.8 @ 122.2	193	109	190	1.04	75.4	17.0 ¹
911 Speedster	\$204,950	F-6	408	310	3520	3.9	9.2	12.2 @ 114.6	193	110	192	0.97	73.4	19.4
911 Turbo S¹	\$162,460	F-6tt	530	516	3590	2.6	6.3	10.7 @ 128.9	195	107	185	1.02	73.3	15.1
Rolle-Royce Ghost¹	\$308,350	V-12tt	563	575	3505	4.7	10.2	12.9 @ 114.3	155 ¹	119	209	0.85	60.1	16.5
Phantom¹	\$346,650	V-12	453	531	5810	5.9	15.3	14.5 @ 97.4	149 ¹	123	219	0.77	57.9	11.7
Rosion Q1	\$108,151	V-6gt	450	390	2675	3.2	7.8	11.6 @ 121.6	185	130	217	1.06	73.0	18.0 ¹
Saleen S7 Twin Turbo	\$602,442	V-8st	750	700	2900 ¹	3.3	6.0	10.6 @ 139.8	250	119	210	1.03	69.9	13.0 ¹
Scion iQ¹	\$19,841	1-4	94	89	2180	10.3	41.5	17.8 @ 78.4	100	131	240	0.80	65.4	30.0 ¹
Shelby GT350	\$82,658	V-8	624	540	3950 ¹	4.2	9.2	12.4 @ 116.7	155 ¹	117	207	0.99	69.2	14.0 ¹
Smart ForTwo passion coupe	\$15,625	1-3	70	68	1825	13.3	na	19.2 @ 70.5	90 ¹	130	230	0.72	57.6	33.0 ¹
Spyker C8 Spyder	\$296,785	V-8	400	354	2985	4.4	10.3	12.7 @ 112.0	160	120	204	0.92	60.1	18.0
Sabaru Impreza 2.0i	\$20,845	F-4	148	145	3180	7.8	21.2	15.9 @ 88.1	115 ¹	133	238	0.88	64.2	25.5
Impreza WRX ST Limited	\$39,870	F-4	305	290	3455	4.9	13.3	13.4 @ 100.6	155	119	211	0.91	70.9	16.0 ¹
Legacy 2.5GT Limited	\$34,340	F-4	265	258	3545	5.6	14.4	14.1 @ 98.8	150 ¹	125	223	0.94	68.8	23.0 ¹
Legacy 3.6R Limited¹	\$32,383	F-6	256	247	3555	6.5	16.7	14.9 @ 95.6	149 ¹	129	232	0.81	63.8	19.2
Tesla Roadster	\$118,400	Elec	248	276	2550	4.0	11.1	12.7 @ 105.3	121	119	210	0.92	68.6	16.0 ¹
Roadster Sport	\$159,145	Elec	288	295	2790	3.7	10.9	12.6 @ 104.9	125 ¹	123	210	0.96	70.3	16.0 ¹
Volkswagen Beetle Turbo¹	\$29,865	1-4t	200	207	3245	6.4	16.7	14.9 @ 95.4	130 ¹	136	242	0.85	66.9	26.1
Golf GTI 3-dr¹	\$31,900	1-4t	200	207	3370	6.1	15.8	14.6 @ 96.9	130 ¹	163	247	0.86	66.2	25.0 ¹
Golf R	\$36,860	1-4t	256	243	3431	5.7	14.0	14.0 @ 100.1	130 ¹	130	230	0.89	69.8	20.0 ¹
Jetta GLI Autobahn	\$23,615	1-4t	200	207	3280	6.9	16.8	15.2 @ 95.0	130 ¹	147	257	0.88	66.5	25.9
Volvo Polestar C30	na	1-5t	405	510	3430	4.2	10.8	12.8 @ 119.9	155 ¹	117	198	0.99	72.5	na
SG60 T6 AWD¹	\$46,200	1-6t	300	325	3950	5.5	13.9	14.1 @ 100.6	130 ¹	118	210	0.87	66.5	20.2
S80 V8 AWD¹	\$56,025	V-8	311	325	4080	5.6	14.3	14.2 @ 99.4	155 ¹	123	210	0.85	64.6	16.3
V70¹	\$34,410	1-6	235	236	3530	7.3	18.6	15.6 @ 92.3	130 ¹	131	230	0.82	63.0	21.5 ¹



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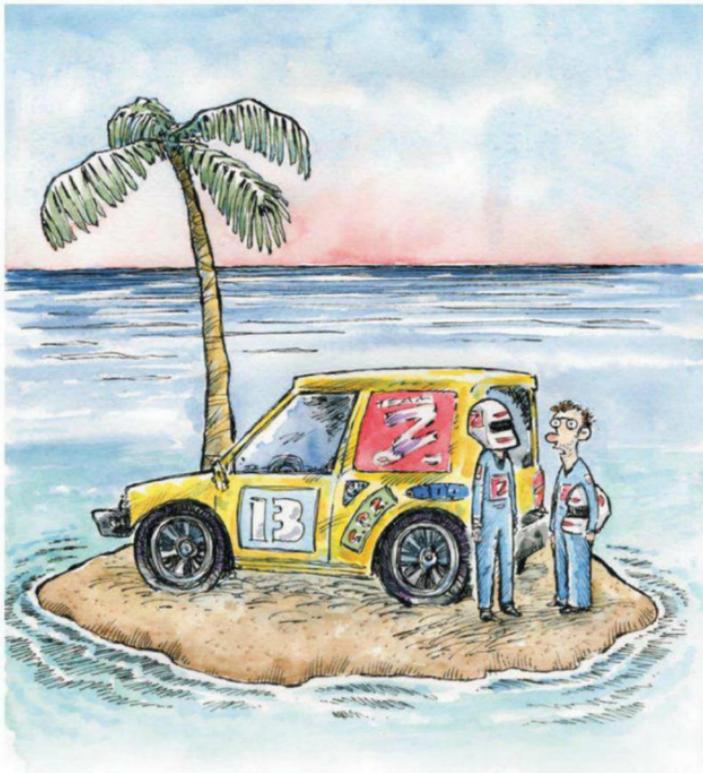
RBT Classics

The following cars are chosen from thousands in our Road Test archives. Some have relevance to stories in this issue, others are here purely to pique your curiosity.

Toyota Corolla GT-5	9-84	\$11,615	1-4	112	97	2450	10.5	36.0¹	18.6 @ 79.5	115	147	256	na	60.8	25.0
Nova 240SX	9-88	\$14,500	1-4	140	152	2800	8.8	24.1¹	16.5 @ 84.5	125	148	252	0.82	64.1	25.0 ¹
Mazda MX-5 Miata	7-89	\$15,550	1-4	116	100	2205	9.5	na	17.0 @ 81.5	117 ¹	154	270	0.83	62.4	25.5
Ferrari F355 Berlinetta	10-94	\$143,950	V-8	380	492	3150 ¹	4.9	11.3	11.3 @ 110.0	183 ¹	119	217	na	na	14.0 ¹
Porsche Boxster	12-96	\$46,046	F-6	201	181	2755 ¹	6.1	na	14.7 @ 93.2	149	120	210	na	65.0	22.0 ¹



P.S.



DAVE COFFERY

"Seriously, Bob, you might be the worst desert rally navigator ever."

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CANADIAN IDENTIFICATION STATEMENT: Publications Mail Agreement No. 40012499. Canadian Registration Number 126018209RT0001.

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