

Automobile

2013 Automobile of the Year: Tesla Model S

From our January, 2013 issue / By [David Zenlea](#) / Photos by A. J. Mueller



Last summer, *Automobile Magazine* editors had the opportunity to interview Elon Musk, CEO of Tesla, as the company launched its all-new electric sedan. A well-known industry insider warned us not to fall for Musk's smooth talk. "Don't bring any cash," he said. "Because you'll be offering to give it to him twenty minutes into the interview."

To say there's healthy skepticism regarding Tesla and its new wundercar is an understatement: in many industry circles, it borders on outright hostility. We understand why. Building a car -- any car -- is really hard. Musk, the PayPal billionaire whose automotive accomplishments were limited to converting 2350 Lotus Elises to run on batteries, was not only proposing a class-leading sport sedan, but he promised it would have a more advanced electric powertrain than anything global automakers could muster.



He was doing this with our money -- your money -- courtesy of a \$465 million loan from the Department of Energy, and he claimed to be doing it for our own good: "Since we are not appropriately pricing the CO2 capacity of the oceans and atmosphere, then the only way I could think to address that was with innovation."

We believe the proper business term to describe such a gambit is *chutzpah*.

We left the interview with our wallets no lighter, eager to see how the Model S would perform in the real world, removed from Musk's spin and Tesla's chaperones. As it happened, that opportunity arrived at our

Automobile of the Year exercise. That's a rather intimidating environment to make a first impression, especially given that this year's field was the strongest in recent memory. We weren't expecting much from the Tesla other than some interesting dinner conversation as we considered "real" candidates like the Subaru BRZ and the Porsche Boxster. In fact, the Tesla blew them, and us, away.

Actually, the Model S can blow away almost anything. "It's the performance that won us over," admits editor-in-chief Jean Jennings. "The crazy speed builds silently and then pulls back the edges of your face. It had all of us endangering our licenses." Our Model S was of Signature Performance spec, which means its AC induction motor puts out 416 hp and that it blasts to 60 mph in 4.3 seconds. Even those numbers -- positively absurd for a large sedan that uses not a lick of gasoline -- fail to communicate how crazy it actually feels. "It's alarming to jam the accelerator of such a big car and have it surge forward so quickly and so quietly," says copy editor Rusty Blackwell. Like most electric cars, the Model S generates its torque almost instantly. Unlike most electric cars, Tesla's torque amounts to a prodigious 443 lb-ft, all of which goes to the rear wheels. The only indicators of your stunning momentum are the rush of scenery around you, a faint whine, and the digital speedometer's difficulty keeping pace. "Driving the Model S is decidedly not like piloting a Nissan Leaf or an electric Smart," notes road test editor Christopher Nelson. Contributor Ezra Dyer, meanwhile, was so impressed that he arranged an informal drag race to 100 mph with a 560-hp BMW M5. The Model S won. "It bears repeating: this thing is silly quick," he concluded.

Of course, straight-line speed is hardly our only qualification for Automobile of the Year. Tesla's first car, the two-seat Roadster, was even quicker but never made a serious bid for our award. That car was something of a one-trick pony -- everything else about the \$100,000 Roadster felt like the \$50,000 Lotus Elise on which it was based. The Model S, developed by Tesla from the ground up and assembled at its factory in Fremont, California, is a holistic and incredibly novel experience.

The Model S looks conventional enough -- somewhat disappointingly so. But that impression fades as soon as you walk up to it and the flush door handle powers out to meet your touch. Climb into the Tesla for the first time, and you're liable to spend a few minutes searching for the ignition button. You won't find it -- the car turned on when you sat down, and it's now waiting for you to shift into drive and glide away. The cabin is airy, modern, spacious, and impeccably trimmed in leather and wood. A flat battery pack and a rear-mounted motor yield a completely flat floor and a large, useful center-console storage area (the Model S uses a column-mounted shift lever supplied by Mercedes-Benz). Additional storage areas, such as map pockets in the door panels, might be nice but would spoil the interior's appealing, Bauhaus simplicity.

An absolutely enormous, seventeen-inch touchscreen dominates the dashboard and features the controls for everything from the radio to the steering effort. That sounds like a recipe for disaster, but here it works wonderfully. Oh, yeah, and you can surf the Web on it, as well. "We turned a lot of preconceived notions on their head and said, 'Why does it have to be that way?'" says Tesla lead designer Franz von Holzhausen. Of course, practically every new car claims to be revolutionary. But this one actually feels like it is, to the point that many of us were reaching outside the automotive lexicon to describe it. "It reminds me of the first time I used an iPhone," gasped associate web editor Ben Timmins.



There's much about the Model S, which Musk himself refers to as "Tesla's Macintosh," that has an innovative, Apple flavor. As with the tech giant's slickest products, there's a sense that even the smallest details here have been lavished with attention in order to be as distinctive and elegant as possible. To open the panoramic sunroof, for instance, one brings up an overhead image of the car on the touchscreen and literally drags the roof as far back as desired. Why didn't anyone think of that before? Then there's Tesla's controversial but intriguing strategy of distributing its products through company-owned boutiques rather than conventional dealers. It's being run by George Blankenship, who set up those posh Apple stores. Finally, it's hard to ignore that Tesla has in Musk a Steve Jobs-like figure, a relentless leader who guides the company's direction. "They're both brilliant, both thinking about things that other people won't be thinking about for twenty years," Blankenship says.

For all its high-tech novelty, the Model S does an exceptional job at the things we expect any high-priced sport sedan to do well. The electric power steering is nuanced and well-weighted, with natural buildup just off-center. Through corners, the Model S exhibits impressive body control and vacuumlike grip despite weighing more than 4500 pounds. Editors also raved about the suspension's ability to soak up bumps that tortured other test cars. It was just as impressive on the racetrack -- yes, we took it on the track. "All that speed, along with powerful braking, superflat handling, and sharp steering, gives you the sense that you're invincible," marvels Jennings. And although the exterior may be lacking in gotta-have-it character, it deserves credit for achieving a claimed 0.24 coefficient of drag -- better than a Toyota Prius or a Chevrolet Volt -- without those cars' gawky styling. The only concession to weirdness and egotism are the optional rear-facing third-row seats, which Musk wanted so he could ferry around his many children.

The car's professionalism owes to the fact that, despite its Silicon Valley sheen, Tesla employs plenty of people who know a lot about building cars. That begins with von Holzhausen, who penned the Pontiac Solstice, our 2006 Design of the Year, before moving on to Mazda. He joined Tesla's design team four years ago -- when Tesla basically didn't have a design team. "There was nothing here," he says. Huibert Mees of the Ford GT program led development of the Model S's chassis components, and the steering was likewise developed by Ford and Lotus veterans. Despite Musk's domineering reputation, the employees we've spoken to say he has a relatively hands-off management style. Continuing the comparison with the famously involved Jobs, Blankenship notes, "Steve hired incredibly bright people to get done what he wanted to get done. I think Elon hires incredible people and expects them to do what they were hired to do."

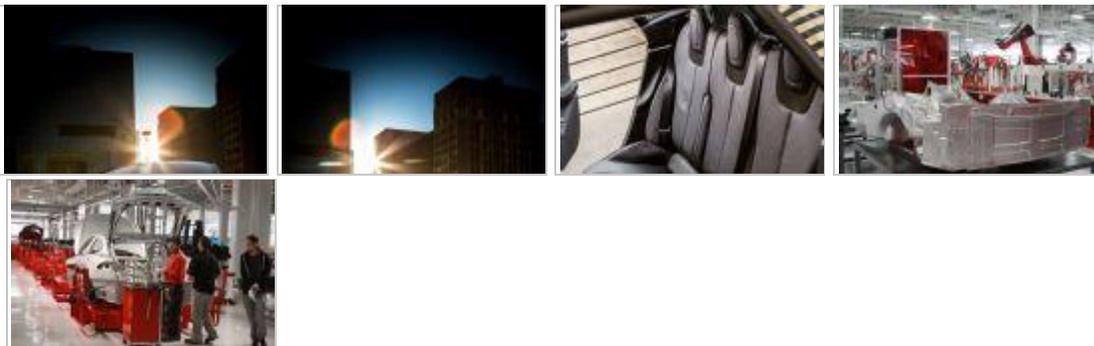
You'll note that we haven't even discussed Tesla's *raison d'être*, which is, in Musk's words, "To accelerate the advent of electric cars." That's another credit to the Model S's overall execution and seductive powers. "The electric motor does not define this car," says Nelson. But it is, at the end of the day, what makes this very good sport sedan an absolute game changer. The Model S's range, rated by the EPA at 265 miles with the largest battery, finally fits the American conception of driving. Want to take the family from Washington, D.C., to New York? No problem. Stop for an hour at one of Tesla's Supercharger stations being installed throughout the country, and you can travel on to Boston. The even bigger psychological advantage, though, is the freedom to go about your daily life, with all its spontaneity and last-minute shopping trips, without the

fear of running low. Electric cars that participated in past Automobile of the Year competitions have required special testing procedures -- shorter drive routes, strict guidelines against aggressive driving, industrial charging trucks. The Model S wore no such kid gloves. We plugged it in at night and then drove it all day -- and drove it hard.

Granted, this freedom doesn't come cheap. A Model S with an 85-kilowatt-hour battery, like the one we tested, starts at \$78,750 (before a \$7500 tax break). Less expensive versions have smaller batteries and shorter ranges, starting with \$58,570 for 160 miles (again, before deductions). Put another way, though, the cheapest 85-kWh Model S offers more than three times the range of a Nissan Leaf for little more than twice the price. The battery pack should also be rather durable thanks to liquid cooling. But the most important factor here is that, more than any electric car that has come before it, the Model S feels and drives like a gasoline car of the same price. "There's still a lot of novelty in driving an EV," says senior editor Eric Tingwall, "but with the Model S, that's no longer the only reason to drive one." Design editor Robert Cumberford is more succinct: "I would happily own one."

But you might not be able to get one. Only 250 sedans have been delivered to customers as of this writing -- a rounding error for any mainstream automaker (some 13,000 customers have put down at least \$5000 as a reservation). Musk himself admits that Tesla's path to viability is far from complete. "There have been car company start-ups before. The real challenge is to ramp up production. Then we're a real car company."

We can't say for certain whether Tesla will be able to make that happen. The auto industry is tough enough for a giant like General Motors. What we can say with this award is that Tesla deserves to succeed. It has managed to blend the innovation of a Silicon Valley start-up, the execution of a world-class automaker, and, yes, the chutzpah of its visionary leader. The result is the Model S. It's not vaporware. It's our Automobile of the Year.



Supercharging the electric car

by Eric Tingwall

An 85-kWh battery puts the Model S's range on par with conventional cars, but recharging still can't match the speed and convenience of pumping gasoline. Despite that, Tesla intends to make long-distance, multi-charge road trips possible with a network of high-speed chargers that can inject 150 miles of range into the battery in thirty minutes. These Superchargers bypass the car's onboard equipment and feed 400 volts of direct-current electricity straight to the battery through a thick, vinelike cord. Interestingly, the hardware that transforms the electricity from alternating current to direct current is the same as what's carried in the car for 120- and 240-volt charging. The difference is that a Model S has one or two 10-kW chargers onboard, while the stationary Supercharger system uses a stack of twelve units that can produce a total of 120 kW.



Supercharger hardware comes standard on the 85-kWh Model S, and it's a \$2000 option on 60-kWh models. Either way, owners are entitled to free electricity from the Superchargers for the life of their car.

Some Supercharger stations will be paired with solar-panel-clad carports supplied by SolarCity, another Musk outfit. This arrangement gives owners a clear conscience when it comes to the environmental impact of their electricity sources, as Tesla claims the photovoltaic panels will feed more electricity into the grid than the Superchargers will to cars. Today, there are just six Superchargers scattered throughout California, but Tesla claims that owners will be able to drive from San Diego to Vancouver, Miami to Montreal, and Los Angeles to New York, stopping at Superchargers along the way, by next year.

Electric cars

The long, (mostly) slow struggle.

//**1830s** The first rudimentary electric vehicles emerge, powered by one-use power-storage units. The four-stroke gasoline engine is still four decades away.

//**1859** Rechargeable lead-acid storage batteries are invented in France.

//**circa 1890** William Morrison of Des Moines, Iowa, produces the first American electric car. Powered by 24 batteries, it has 4 hp and can go 20 mph -- double the top speed of Karl Benz's gas-powered Patent-Motorwagen. Maximum range is 40 to 50 miles.

//**1899** Belgian Camille Jenatton hits 65.8 mph in La Jamais Contente, his missile-shaped electric car.

//**1900** Electric cars account for more than a third of all sales in the fledgling U.S. auto market and prove especially popular in cities.

//**1909** Thomas Edison perfects his nickel-iron battery and markets it to automakers.

//**1912** Electric cars lose their most compelling advantage -- convenience -- when Cadillac introduces "the car that has no crank."

//**1913** A Detroit Electric travels 211 miles on a single charge, setting a new record. Range of 80 miles is more typical. Prices start at about \$2650, equivalent to \$61,300 in today's dollars.

//**by 1920** High cost, limited range, and cheap oil contribute to a sharp decline in electric-car sales.

//**1940** Detroit Electric, which had shifted to commercial vehicles and outlasted all of its competitors, finally goes out of business.

//**1974** The Florida-built CitiCar debuts and offers about 30 miles of range. It's relatively popular, finding more than 2000 buyers in its first two years. But the homely, plastic-bodied two-seater does nothing to improve the greater perception of electric cars.

//**1996** General Motors begins leasing the EV1, the first modern electric car. Range starts at 70 to 100 miles. An upgraded version with nickel-metal-hydrate batteries goes on sale three years later with 100 to 140 miles of range.

//**2003** The California Air Resources Board ends its initiative to require zero-emissions vehicles. GM, along with Toyota and others, ceases production of electric vehicles soon thereafter. Meanwhile, in Silicon Valley, Tesla is born.

//**2008** Despite several fits and starts, the Lotus Elise-based, lithium-ion-battery-powered Tesla Roadster goes on sale. Then-chairman Elon Musk promises a scratchbuilt BMW 5-series competitor within three years.

//**2009** Tesla, along with several other firms, receives millions of dollars in funding from the U.S. Department of Energy. It uses the loan to develop the "Whitestar" (the Model S) and to acquire Toyota's shuttered plant in Fremont, California.

//**2010** The Nissan Leaf brings the electric car to the mainstream. We name the plug-in hybrid Chevrolet Volt the 2011 Automobile of the Year.

//**2011** The Fisker Karma wins our 2012 Design of the Year.

//**2012** The introductions of an electrified Honda Fit and Ford Focus, a Tesla-powered Toyota RAV4, and, of course, the Model S, make for the busiest year in electric cars since the early twentieth century.

Fifty years at Fremont

From Chevys to Toyotas to Teslas

by Ronald Ahrens

The factory in Fremont, California, where the Tesla Model S is built, has always been cutting-edge, with operations continually tinged by government involvement. Constructed near San Francisco Bay's backwaters in 1962, the "four-in-one" Fremont Assembly Plant represented General Motors' greatest effort to avoid monopoly prosecution. If GM made Chevrolets alongside Buicks, Oldsmobiles, and Pontiacs, how could the Justice Department carry out its threat to spin off Chevy as a separate company?

Two years after job one, GM head Frederic Donner came to Fremont, announcing a \$2 billion worldwide manufacturing expansion. Governor Pat Brown also attended and delivered "quite a political talk and tossed out figures that were a great deal bigger," Chevy chief Semon "Bunkie" Knudsen wrote.

But GM proved a vulnerable monopoly. Fremont closed in 1982. Thanks to a GM/Toyota joint venture, it reopened in 1984 as New United Motor Manufacturing, Inc. Toyota used NUMMI to evade import restrictions threatened by Congress. Meanwhile, GM learned lean manufacturing practices. The Toyota Corolla (rebadged as the Chevy Nova and the Geo Prizm), the Toyota Matrix, and the Pontiac Vibe were among roughly eight million vehicles produced before the partnership ended in 2009. Toyota subsequently struck a deal with Tesla that included factory space, California offered tax incentives, and Tesla landed a \$465 million federal loan.

Tesla paid \$42 million for the factory in May of 2010 and an additional \$17 million for machine tools and spare parts.

"We had this megafactory, and we wanted to take full advantage of the infrastructure in order to manufacture at very low cost," said Gilbert Passin, Tesla's vice president of manufacturing. He noted that Tesla also salvaged tooling at bargain prices elsewhere in the distressed auto industry. While a new plant at a greenfield site typically represents an investment of at least \$1 billion, Tesla probably has less than one-third that amount tied up in Fremont. Passin said 95 percent of all Model S parts are made in-house, an uncommonly high amount in an industry that relies heavily on outside suppliers.

Visiting last summer, we saw that only a portion of the five million square feet of floor space was in use. In an upstairs clean room, about 350 employees -- some of whom formerly worked for NUMMI -- put together battery packs and electric-drive components on two shifts, while another 450 workers sporadically assembled bodies and chassis on ground level. (Corporate headquarters lies across the Bay, in Palo Alto, and the design center is in Southern California.) The Tesla factory's innovative modular assembly process relies on so-called "smart carts" to carry the bodies through assembly, automatically raising or lowering as needed and periodically recharging while traversing the line. This method turns away from the traditional use of overhead conveyors, saving millions of dollars. Meanwhile, each newly purchased robot typically performs five different tasks, and advanced artificial intelligence allows one to install the Model S's panoramic roof by analyzing a digital image.

Tesla hoped to ramp up to eighty cars per shift by the end of 2012, but during our walk-through, it was quiet enough to hear a silver dollar drop.

Read

more: http://www.automobilemag.com/features/awards/1301_2013_automobile_of_the_year_tesla_model_s/viewall.html#ixzz2BN5Z4e6r